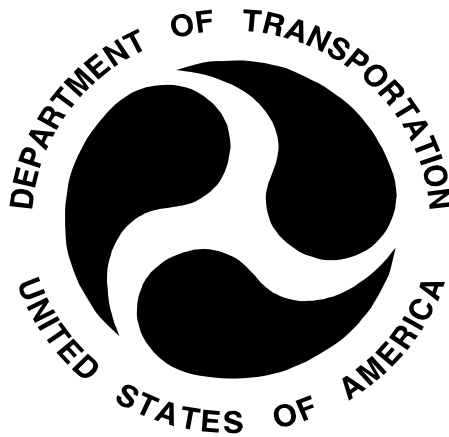


**126-TRC-10-008**

**SAFETY COMPLIANCE TESTING FOR FMVSS 126  
Electronic Stability Control Systems**

Chrysler Group LLC  
2010 Jeep Liberty  
NHTSA No. CA0304

TRANSPORTATION RESEARCH CENTER INC.  
10820 State Route 347  
East Liberty, Ohio 43319



January 12, 2011

FINAL REPORT

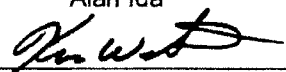
Prepared Under Contract No.: DTNH22-08-D-00097

U. S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Enforcement  
Office of Vehicle Safety Compliance  
1200 New Jersey Avenue, SE  
West Building, 4<sup>th</sup> Floor (NVS-221)  
Washington, DC 20590

Prepared for the Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-08-D-00097.

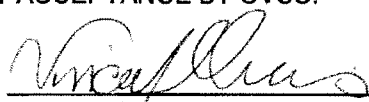
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Approval Date: 1/12/11

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: 

Acceptance Date: 1/12/11



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16. Abstract  A test was conducted on a 2010 Jeep Liberty, NHTSA No. CA0304, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-126-02 for the determination of FMVSS 126 compliance. Test failures identified were as follows: None			
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## **1.0 PURPOSE OF COMPLIANCE TEST**

The purpose of this test is to determine if the test vehicle, a MY 2010 Jeep Liberty meets the minimum equipment and performance requirements stated in Federal Motor Vehicle Safety Standard (FMVSS) 126, "Electronic Stability Control Systems."

This standard establishes performance and equipment requirements for Electronic Stability Control (ESC) Systems installed in passenger cars, multipurpose passenger vehicles, trucks, and buses with a gross vehicle weight rating of 4,536 kilograms or less.

## **2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS**

Testing of the MY 2010 Jeep Liberty was conducted at Transportation Research Center Inc. (TRC Inc.) in accordance with NHTSA TP-126-02, dated November 19, 2008.

The vehicle was inspected to ensure it was equipped with an ESC System that:

- Augments vehicle directional stability by applying and adjusting brake torques individually at each wheel to induce a correcting yaw moment to a vehicle;
- Is computer controlled with the computer using a closed-loop algorithm to limit vehicle oversteer and to limit vehicle understeer;
- Has a means to determine the vehicle's yaw rate and to estimate its side slip or side slip derivative with respect to time;
- Has a means to monitor driver steering inputs;
- Has an algorithm to determine the need, and a means to modify engine torque, as necessary, to assist the driver in maintaining control of the vehicle, and;
- Is operational over the full speed range of the vehicle (except at vehicle speeds less than 20km/h (12.4mph), when being driven in reverse, or during system initialization).

The vehicle was subjected to a 0.7Hz Sine with Dwell (SWD) Steering Maneuver to ensure that it would meet the stability and responsiveness requirements of the standard as follows:

- At 1.0 second after completion of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 35 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks during the same test run).
- At 1.75 seconds after completion of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 20 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks during the same test run).
- The lateral displacement of the vehicle center of gravity with respect to its initial straight path must be at least 1.83 m (6 feet) (for vehicles with a GVWR of 3,500kg (7,716 lbs.) or less) when computed 1.07 seconds after the Beginning of Steer (BOS) at the specified steering wheel angles.

System malfunction simulations were executed to verify vehicle could identify and indicate a malfunction.

The vehicle's ESC System appears to meet the performance and equipment requirements as required by FMVSS 126. The test results are summarized on the following summary sheet.

## 2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS ...continued

### DATA SUMMARY (Sheet 1 of 2)

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

VEHICLE NHTSA NO.: CA0304 VIN: 1J4PN2GK1AW179502

VEHICLE TYPE: MPV DATE OF MANUFACTURE: 06/10

LABORATORY: Transportation Research Center Inc.

### REQUIREMENTS

### PASS/FAIL

#### ESC Equipment and Operational Characteristics (Data Sheet 2)

The vehicle is to be equipped with an ESC System that meets the equipment and operational characteristics requirements. (S126, S5.1, S5.6)

PASS

#### ESC Malfunction Telltale (Data Sheet 3)

The vehicle is equipped with a telltale that indicates one or more ESC System malfunctions. (S126, S5.3)

PASS

#### “ESC Off” and other System Controls and Telltale (Data Sheet 3 & 4)

The vehicle is equipped with an ESC off telltale indicating the vehicle has been put into a mode that renders the ESC System unable to satisfy the performance requirements of the standard, if such a mode exists. (S5.5.1)

PASS

## 2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS ...continued

### DATA SUMMARY (Sheet 2 of 2)

#### REQUIREMENTS

#### PASS/FAIL

If provided, off control and other system controls as well as the ESC off telltale meets the operational requirements (S126, S5.4, S5.4.1, S5.4.2, S5.5.4, and S5.5.9)

PASS

#### Vehicle Lateral Stability (Data Sheet 8)

Yaw Rate Ratio at 1 second after COS is less than 35% of peak value. (S126, S5.2.1)

PASS

Yaw Rate Ratio at 1.75 seconds after COS is less than 20% of peak value. (S126, S5.2.2)

PASS

#### Vehicle Responsiveness (Data Sheet 8)

Lateral displacement at 1.07 seconds after BOS is at least 1.83 m (6 feet) for vehicles with a GVWR of 3,500 kg (7,716 lbs.) or less, and 1.52 m (5 feet) for vehicles with a GVWR greater than 3,500 kg (7,716 lbs.). (S126 S5.2.3)

PASS

#### ESC Malfunction Warning (Data Sheet 9)

Warning is provided to driver after malfunction occurrence. (S126. S5.3)

PASS

Malfunction telltale stayed illuminated as long as malfunction existed and must extinguish after malfunction was corrected. (S126, S5.3.7)

PASS

### 3.0 TEST DATA

**DATA SHEET 1 (Sheet 1 of 2)**  
**TEST VEHICLE INSPECTION AND TEST PREPARATION**

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

NHTSA No.: CA0304 TEST DATE: 08-20-10

VIN: 1J4PN2GK1AW179502 MANUFACTURE DATE: 06/10

GVWR: 2,541 KG      FRONT GAWR: 1,248 KG      REAR GAWR 1,452 KGSEATING POSITIONS: FRONT 2 MID 0 REAR 3

ODOMETER READING AT START OF TEST: 33 (53.1) Miles (Kilometers)

**DESIGNATED TIRE SIZE(S) FROM VEHICLE LABELING:**

Front Axle	235 / 70R 16	Rear Axle	235 / 70R 16
------------	--------------	-----------	--------------

**INSTALLED TIRE SIZE(S) ON VEHICLE:**

<u>From Tire Sidewall</u>	<u>Front Axle</u>	<u>Rear Axle</u>
Manufacturer and Model	<u>Goodyear Wrangler SR-A</u>	<u>Goodyear Wrangler SR-A</u>
Tire Size Designation	235 / 70R 16 104S	235 / 70R 16 104S

Are installed tire sizes same as labeled tire sizes?   X   Yes        No  
If no, contact COTR for further guidance.

**DRIVE CONFIGURATIONS (MARK ALL THAT APPLY):**

<input checked="" type="checkbox"/>	Two Wheel Drive (2WD):	( ) Front Wheel Drive (X) Rear Wheel Drive
	All Wheel Drive (AWD)	
<input checked="" type="checkbox"/>	Four Wheel Drive Automatic – differential not locked full time (4WD Automatic)	
	Four Wheel Drive High Gear Unlocked Center Differential	
	Four Wheel Drive High Gear Locked Center Differential	
	Four Wheel Drive Low Gear Unlocked Center Differential	
<input checked="" type="checkbox"/>	Four Wheel Drive Low Gear Locked Center Differential	
	Other (define _____)	

**3.0 TEST DATA....continued**

**DATA SHEET 1 (Sheet 2 of 2)**  
**TEST VEHICLE INSPECTION AND TEST PREPARATION**

**DRIVE CONFIGURATIONS AND MODES: (ex. default, performance, off)**

(For each of the vehicle's drive configurations identify available operating modes)

Drive Configuration 2WD  
Mode(s) default

Drive Configuration 4WD Auto  
Mode(s) default

Drive Configuration 4WD Low  
Mode(s) ESC Off

**VEHICLE STABILITY SYSTEMS (Check applicable technologies):**

  X   ESC                        X   Traction Control                        X   Roll Stability Control  
       Active Suspension        X   Electronic Throttle Control                             Active Steering  
  X   ABS

List other systems; Brake Assist System

REMARKS:

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-20-10  
DATE: 09-24-10

### 3.0 TEST DATA....continued

#### DATA SHEET 2 (Sheet 1 of 2) ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

NHTSA No.: CA0304 TEST DATE: 08-20-10

#### ESC SYSTEM IDENTIFICATION:

Manufacturer / Model Bosch / ESP8.1

ESC SYSTEM HARDWARE (Check applicable hardware):

<input checked="" type="checkbox"/> Electronic Control Unit	<input checked="" type="checkbox"/> Hydraulic Control Unit
<input checked="" type="checkbox"/> Wheel Speed Sensors	<input checked="" type="checkbox"/> Steering Angle Sensor
<input checked="" type="checkbox"/> Yaw Rate Sensor	<input checked="" type="checkbox"/> Lateral Acceleration Sensor

List other components: \_\_\_\_\_

#### ESC SYSTEM OPERATIONAL CHARACTERISTICS:

System is capable of generating brake torques at each wheel ☒ Yes (PASS)  
\_\_\_\_\_ No (FAIL)

List and describe component(s): Hydraulic Control Unit

System is capable of determining yaw rate ☒ Yes (PASS)  
\_\_\_\_\_ No (FAIL)

List and describe component(s): Yaw Rate Sensor

System is capable of monitoring driver steering input ☒ Yes (PASS)  
\_\_\_\_\_ No (FAIL)

List and describe component(s): Steering Wheel Angle Sensor

System is capable of estimating side slip or side slip derivation ☒ Yes (PASS)  
\_\_\_\_\_ No (FAIL)

List and describe component(s): Yaw Sensor with Lateral Acceleration Sensor; Steering wheel angle sensor; Brake light switch; Primary pressure sensor; Wheel speed sensor; ESC Control Unit; Hydraulic modulator; Wheel brakes; Engine management ECU



### 3.0 TEST DATA....continued

#### DATA SHEET 2 (Sheet 2 of 2) ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

##### ESC SYSTEM OPERATIONAL CHARACTERISTICS (continued):

System is capable of modifying engine torque during ESC activation. ☒ Yes (PASS)  
☐ No (FAIL)

Method used to modify engine torque: When the engine controller receives a torque request over the CAN bus, the engine decides the appropriate combination of air, fuel, and spark to accomplish the requested torque.

System is capable of activation at speeds of 20 km/h (12.4 mph) and higher. ☒ Yes (PASS)  
☐ No (FAIL)

Speed system becomes active. The minimum speed for system functionality is 2.8 km/h (1.8 mph), however, below 14.4 km/h, the ESC thresholds are increased to prevent unnecessary interventions. Normal control is available above 14.4 km/h.

System is capable of activation during the following driving phases (acceleration, deceleration, coasting, and during activation of ABS or traction control). ☒ Yes (PASS)  
☐ No (FAIL)

Driving phases that the system is capable of activation. The system is capable of activation during acceleration, coasting, braking (including ABS control) and gear shifts in the forward driving direction.

Vehicle manufacturer submitted documentation explaining how the ESC system mitigates understeer? ☒ Yes (PASS)  
☐ No (FAIL)

DATA INDICATES COMPLIANCE PASS/FAIL PASS

REMARKS:

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-20-10  
DATE: 09-24-10

### 3.0 TEST DATA....continued

#### DATA SHEET 3 (Sheet 1 of 2) ESC MALFUNCTION AND OFF TELLTALES

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

VEHICLE NHTSA NO. CA0304 TEST DATE: 08-20-10

#### **ESC Malfunction Telltale**

Vehicle is equipped with malfunction telltale? X Yes (Pass)        No (Fail)

Telltale Location Right side of tachometer

Telltale Color Yellow

Telltale symbol or abbreviation used.



Or **ESC**

       Vehicle uses this symbol  
       Vehicles uses this abbreviation  
X Neither symbol or abbreviation is used

If different than identified above, make note of any message, symbol or abbreviation used.

The ESC malfunction telltale uses the words "ESP BAS" and it illuminates continuously if a malfunction has been detected in either the ESP or the Brake Assist System (BAS) or both systems.

Is telltale part of a common space?        Yes X No

Is telltale also used to indicate activation of the ESC system?        Yes X No

If yes, explain telltale operation during ESC activation: N/A

3.0 DATA SHEETS....continued

DATA SHEET 3 (Sheet 2 of 2)  
ESC MALFUNCTION AND OFF TELLTALES

**“ESC OFF” Telltale (if provided)**

Vehicle is equipped with “ESC Off” telltale? ☒ Yes ☐ No

Is “ESC OFF” telltale combined with “ESC Malfunction” telltale utilizing a two part telltale?

☐ Yes ☒ No

Telltale Location Center of instrument cluster, between the tachometer and speedometer

Telltale Color Yellow

Telltale symbol or abbreviation used.



Or **ESC OFF**

- ☒ Vehicle uses this symbol  
☐ Vehicle uses this abbreviation  
☐ Neither symbol or abbreviation is used

If different than identified above, make note of any message, symbol or abbreviation used.

Note: The telltale does not display the word “OFF” underneath the symbol. For “Partial ESC Off” condition, only the ESC telltale illuminates. For “Full ESC Off” condition, the telltale illuminates and the message “ESC Off” displays in the odometer message center.

Is telltale part of a common space? ☐ Yes ☒ No

DATA INDICATES COMPLIANCE

(Vehicle is compliant if equipped with a malfunction telltale)

PASS/FAIL PASS

**REMARKS:**

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-20-10  
DATE: 09-24-10

### 3.0 TEST DATA....continued

#### DATA SHEET 4 (Sheet 1 of 3) ESC AND ANCILLARY SYSTEM CONTROLS

##### “ESC OFF” Controls Identification and Operational Check:

Is the vehicle equipped with a control or controls whose purpose is to deactivate the ESC system or place the ESC system in a mode or modes that may no longer satisfy the performance requirements of the standard?

  X   Yes           No

Type of control or controls provided?  
(mark all that apply)

           Dedicated “ESC Off” control  
      X       Multi-functional control with an  
                  “ESC Off” mode  
           Other (describe)

Identify each control location, labeling and selectable modes.

First Control:	Location	<u>Below the climate control panel</u>
	Labeling	<u>Skidding car symbol with the word “OFF” underneath</u>
	Modes	<u>TCS Partial Off and ESC Partial Off</u>
		<u>TCS On and ESC On</u>
		<u>TCS Full Off and ESC Full Off</u>

Identify standard or default drive configuration          2WD - default      

Verify standard or default drive configuration selected.      X   Yes           No

Does the “ESC Off” telltale illuminate upon activation of the dedicated ESC off control or selection of the “ESC Off” mode on the multi-function control?

  X   Yes           No (fail)

Does the “ESC Off” telltale extinguish when the ignition is cycled from “On” (“Run”) to “Lock” or “Off” and then back again to the “On” (“Run”) position?

  X   Yes           No (fail)

If no, describe how the off control functions:

\_\_\_\_\_  
\_\_\_\_\_

### 3.0 TEST DATA....continued

#### DATA SHEET 4 (Sheet 2 of 3) ESC AND ANCILLARY SYSTEM CONTROLS

If a multi-function control is provided, cycle through each mode setting on the control and record which modes illuminate the "ESC Off" telltale. Also, for those modes that illuminate the ESC Off" telltale identify if the telltale extinguishes upon cycling the ignition system.

Control Modes	"ESC Off" telltale illuminates upon activation of control? (Yes/No)	"ESC Off" telltale extinguishes upon cycling ignition? (Yes/No)
ESC On		
Partial Off (ESC & TCS)	Yes	Yes
Full Off (ESC & TCS)	Yes	Yes

For each mode that illuminates the "ESC Off" telltale, did the telltale extinguish when the ignition was cycled from "On" ("Run") to "Lock" or "Off" and then back again to the "On" ("Run") position?

☒ X Yes ☐ No fail)

#### Other System Controls that have an ancillary effect on ESC Operation:

Is the vehicle equipped with any ancillary controls that upon activation may deactivate the ESC System or place the ESC System in a mode or modes that may no longer satisfy the performance requirements of the standard?

☒ X Yes ☐ No

List and describe each control (i.e. alternate drive configuration selection controls):

Ancillary Control:	System	4WD Low Transfer Case
	Control Description	3 position switch located next to gear shift
	Labeling	2WD, 4WD Lock, 4WD Low
Ancillary Control:	System	N/A
	Control Description	N/A
	Labeling	N/A

### 3.0 TEST DATA....continued

#### DATA SHEET 4 (Sheet 3 of 3) ESC AND ANCILLARY SYSTEM CONTROLS

Activate each control listed above and record whether the control illuminates the "ESC Off" telltale. Also, record warnings or messages provided regarding the ESC System.

Ancillary Control	Control Activates "ESC Off" Telltale? (Yes/No)	Warnings or Messages Provided
4WD Low	Yes	ESC Off
N/A	N/A	N/A
N/A	N/A	N/A

For those controls that illuminate the "ESC Off" telltale above identify if the "ESC Off" telltale extinguishes upon cycling the ignition system.

Ancillary Control	"ESC Off" telltale extinguishes upon cycling ignition? (Yes/No)
4WD Low	No*
N/A	N/A
N/A	N/A

For each control that illuminates the "ESC Off" telltale, did the telltale extinguish when the ignition is cycled from "On" ("Run") to "Lock" or "Off" and then back again to the "On" ("Run") position? If the control activated places the vehicle into a low-range four-wheel drive configuration designed for low-speed, off-road driving, the ESC System may remain turned off after the ignition has been cycled off and then back on and therefore the "ESC Off" telltale may not extinguish.

\_\_\_\_\_ Yes      X   (See Remarks)    No

DATA INDICATES COMPLIANCE:

PASS/FAIL   PASS  

#### REMARKS:

\*The control places the vehicle in a low-range four-wheel drive configuration designed for low-speed, off-road driving, which allows the ESC to remain off after the ignition has been cycled off and then back on.

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-24-10  
DATE: 10-20-10

### 3.0 TEST DATA....continued

#### DATA SHEET 5 (Sheet 1 of 3) VEHICLE AND TEST TRACK DATA

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

NHTSA No.: CA0304 TEST DATE: 08-24-10

**Test Track Requirements:** Test Surface Slope (0-1 %) 1 %  
Peak Friction Coefficient (at least 0.9) 0.97

**Full Fluid Levels:** Fuel X Coolant X Other Fluids Washer (specify)

**Tire Pressures:** **Required:** Front Axle 228 kPa Rear Axle 228 kPa  
**Actual:** LF: 228 kPa RF: 228 kPa LR: 228 kPa RR: 228 kPa

**Vehicle Dimensions:** Track Width 155.6 cm Wheelbase 270.0 cm  
Roof Height 175.0 cm

**Vehicle weight ratings:** GAWR Front 1,248 KG GAWR Rear 1,452 KG

#### Unloaded Vehicle Weight (UVW)

Front Axle 995.2 KG Left Front 509.4 KG Right Front 485.8 KG  
Rear Axle 923.2 KG Left Rear 476.8 KG Right Rear 446.4 KG  
Total UVW 1,918.4 KG

#### Baseline Weight and Outrigger Selection (only for MPVs, Trucks, Buses)

Calculated Baseline Weight (UVW+ 73 kg) 1,991.4 KG

Outrigger size required ("Standard" or "Heavy") Standard  
Standard - Baseline weight under 2,722 kg (6,000 lbs.)  
Heavy - Baseline weight equal to or greater than 2,722 kg (6,000 lbs.)

### 3.0 TEST DATA....continued

#### DATA SHEET 5 (Sheet 2 of 3) VEHICLE AND TEST TRACK DATA

##### UVW with Outriggers (only for MPVs, Trucks, Buses)

Front Axle 1,025.1 KG      Left Front 522.8 KG      Right Front 502.3 KG

Rear Axle 1,003.1 KG      Left Rear 519.4 KG      Right Rear 483.7 KG

**Total UVW w/ Outriggers** 2,028.2 KG

##### Loaded Vehicle Weight w/ Driver and Instrumentation (No Ballast)

Front Axle 1,089.8 KG      Left Front 568.0 KG      Right Front 521.8 KG

Rear Axle 1,071.4 KG      Left Rear 558.2 KG      Right Rear 513.2 KG

**Total Loaded Vehicle Weight** 2,161.2 KG

Ballast Required      = [Total UVW w/ Outriggers + 168 KG] - Total Loaded Weight w/ Driver and Instrumentation

= [ 2,028.2 KG + 168 KG ] - 2,161.2 KG

= 35.0 KG

##### Total Loaded Vehicle Weight

Front Axle 1,092.8 KG      Left Front 560.2 KG      Right Front 532.6 KG

Rear Axle 1,103.4 KG      Left Rear 571.2 KG      Right Rear 532.2 KG

**Total Loaded Vehicle Weight** 2,196.2 KG



### 3.0 TEST DATA....continued

#### DATA SHEET 5 (Sheet 3 of 3) VEHICLE AND TEST TRACK DATA

##### Center of Gravity and Inertial Sensing System Location at Loaded Vehicle Condition

x-distance (longitudinal)      Point of reference is the front axle centerline.  
(Positive from front axle toward rear of vehicle.)

y-distance (lateral)            Point of reference is the vehicle centerline.  
(Positive from the center toward the right.)

z-distance (vertical)           Point of reference is the ground plane.  
(Positive from the ground up.)

##### Locations:

	Center of Gravity	Inertial Sensing System
x-distance	<u>127.1</u> cm	<u>169.4</u> cm
y-distance	<u>-1.39</u> cm	<u>-0.75</u> cm
z-distance	<u>66.7</u> cm	<u>104.1</u> cm

Distance Between Ultrasonic Sensors: 181.9 cm

TEST TRACK DATA MEETS REQUIREMENTS: YES/NO YES

If no, explain: \_\_\_\_\_

REMARKS:

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-24-10  
DATE: 10-20-10

### 3.0 TEST DATA....continued

#### DATA SHEET 6 (Sheet 1 of 3) BRAKE AND TIRE CONDITIONING

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

VEHICLE NHTSA No.: CA0304

Measured Cold Tire Pressures: LF 228 KPA RF 228 KPA

LR 228 KPA RR 228 KPA

Wind Speed 1.8 m/sec  
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 18.9 °C

**Brake Conditioning** Time; 7:55 AM Date; 08-25-10

56 km/h (35 mph) Brake Stops

Number of stops executed (10 required) 10 stops

Observed deceleration rate range (.5g target) 0.54 g

72 km/h (45 mph) Brake Stops

Number of stops executed (3 required) 3 stops

Number of stops ABS activated (3 required) 3 stops

Observed deceleration rate range 1.0 – 1.03 g

72 km/h (45 mph) Brake Cool Down Period

Duration of cool down period (5 minutes min.) 5:02 minutes

### 3.0 TEST DATA....continued

#### DATA SHEET 6 (Sheet 2 of 3) BRAKE AND TIRE CONDITIONING 2WD MODE

**Tire Conditioning Series No. 1** Time: 8:15 AM Date: 08-25-10

Measured Tire Pressures: LF 240 kPa RF 240 kPa  
LR 243 kPa RR 243 kPa

Wind Speed 1.3 m/sec  
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 19.4 °C

30 meter (100 ft) Diameter Circle Maneuver				
Test Runs	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (km/h)
1-3	Clockwise	0.5-0.6	0.55	28.3
4-6	Counterclockwise	0.5-0.6	0.55	27.8

1 Hz 5 Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle For 0.5-0.6g Lateral Acceleration				
Test Runs	Vehicle Speed Km/h(mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1	56±2 (35±1)	30	0.5-0.6	0.34
2	56±2 (35±1)	50	0.5-0.6	0.57
3	56±2 (35±1)		0.5-0.6	
4	56±2 (35±1)		0.5-0.6	

Steering wheel angle that corresponds to a peak 0.5–0.6g lateral acceleration; 50 degrees

1 Hz 10 Cycle Sinusoidal Steering Maneuver				
Test Runs	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1 - 3	56±2 (35±1)	50 (cycles 1-10)	0.5-0.6	0.52
4	56±2 (35±1)	50 (cycles 1-9)	0.5-0.6	0.52
		100 (cycle 10)*	N/A	0.82

\* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9.

### 3.0 TEST DATA....continued

#### DATA SHEET 6 (Sheet 3 of 3) BRAKE AND TIRE CONDITIONING 2WD MODE

**Tire Conditioning Series No. 2** Time: 11:07 AM Date: 08-25-10

Measured Tire Pressures: LF 243 kPa RF 248 kPa

LR 245 kPa RR 248 kPa

Wind Speed 2.7 m/sec  
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 23.3 °C

30 meter (100 ft) Diameter Circle Maneuver				
Test Runs	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (km/h)
1-3	clockwise	0.5-0.6	0.55	28.0
4-6	counterclockwise	0.5-0.6	0.55	27.8

1 Hz 5 Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle For 0.5-0.6g Lateral Acceleration				
Test Runs	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1	56±2 (35±1)	30	0.5-0.6	N/A
2	56±2 (35±1)		0.5-0.6	
3	56±2 (35±1)		0.5-0.6	
4	56±2 (35±1)		0.5-0.6	

Steering wheel angle that corresponds to a peak 0.5–0.6g lateral acceleration; 50 degrees

1 Hz 10 Cycle Sinusoidal Steering Maneuver				
Test Runs	Vehicle Speed (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1 - 3	56±2 (35±1)	50 (cycles 1-10)	0.5-0.6	0.59
4	56±2 (35±1)	50 (cycles 1-9)	0.5-0.6	0.59
		100 (cycle 10)*	N/A	0.85

\* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9.

REMARKS:

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-25-10  
DATE: 10-20-10

### 3.0 TEST DATA....continued

#### DATA SHEET 7 (1 of 2) SLOWLY INCREASING STEER (SIS) MANEUVER 2WD MODE

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

VEHICLE NHTSA No.: CA0304 TEST DATE: 08-25-10

Wind Speed 2.2 m/sec  
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 21.1 °C

Static Data File Number: 0005

Selected Drive Configuration: 2WD

Selected Mode: Default

#### Preliminary Left Steer Maneuver:

Lateral Acceleration measured at 30 degrees steering wheel angle ( $a_{y,30 \text{ degrees}}$ )

$$a_{y,30 \text{ degrees}} = \underline{0.48} \text{ g}$$

Assuming a linear relationship the following ratio should be used to calculate the steering wheel angle at .55g.

$$\frac{30 \text{ degrees}}{a_{y,30 \text{ degrees}}} = \frac{\delta_{SIS}}{0.55 \text{ g}}$$

$$\delta_{SIS} = \underline{34.4} \text{ degrees @ } 0.55\text{g}$$

$$\delta_{SIS} = \underline{40} \text{ degrees (rounded)}$$

#### Steering Wheel Angle at Corrected 0.3 g Lateral Acceleration:

Maneuver #	Initial Steer Direction	Time Clock (5 min max between runs)	Steering Wheel Angle to nearest 0.1 degree (degrees)	All Conditions Met?
0008	Left	8:46 am	-24.1	Yes
0011	Left	8:55 am	-24.8	Yes
0014	Left	8:59 am	-24.6	Yes
0019	Right	9:10 am	24.6	Yes
0021	Right	9:16 am	23.1	Yes
0022	Right	9:19 am	23.7	Yes

### 3.0 TEST DATA....continued

#### DATA SHEET 7 (2 of 2) SLOWLY INCREASING STEER (SIS) MANEUVER STANDARD MODE

##### Average Overall Steering Wheel Angle:

$$\delta_{0.3 \text{ g, overall}} = (|\delta_{0.3 \text{ g, left (1)}}| + |\delta_{0.3 \text{ g, left (2)}}| + |\delta_{0.3 \text{ g, left (3)}}| + \delta_{0.3 \text{ g, right (1)}} + \delta_{0.3 \text{ g, right (2)}} + \delta_{0.3 \text{ g, right (3)}}) / 6$$

$$\delta_{0.3 \text{ g, overall}} = \frac{24.2}{\text{[to nearest 0.1 degree]}} \text{ degrees}$$

REMARKS:

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-25-10  
DATE: 10-20-10

### 3.0 TEST DATA....continued

#### DATA SHEET 8 (1 of 3) VEHICLE LATERAL STABILITY AND RESPONSIVENESS 2WD MODE

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

VEHICLE NHTSA No.: CA0304 TEST DATE: 08-25-10

Tire conditioning completed	<u>X</u>	Yes	<u>      </u>	No
ESC system is enabled	<u>X</u>	Yes	<u>      </u>	No
On track calibration checks have been completed	<u>X</u>	Yes	<u>      </u>	No
On track static data file for each sensor obtained	<u>X</u>	Yes	<u>      </u>	No

Selected Drive Configuration: 2WD  
 Selected Mode: default  
 Overall steering wheel angle ( $\delta_{0.3g, \text{ overall}}$ ) 24.2 degrees  
 Static Data File Number 0027

#### Lateral Stability Test Series No. 1 – Counterclockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5 min between each test run)	Commanded Steering Wheel Angle <sup>1</sup> (degrees)		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [≤ 35%]		YRR at 1.75 sec after COS [≤ 20%]	
		Scalar	Angle	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/Fail	%	Pass/Fail
0029	11:18 am	1.5* $\delta_{0.3g}$	36	9.66	0.02	0.00	0.21	Pass	-0.04	Pass
0030	11:25 am	2.0* $\delta_{0.3g}$	48	13.10	0.02	0.04	0.16	Pass	0.29	Pass
0031	11:29 am	2.5* $\delta_{0.3g}$	61	16.65	0.06	0.10	0.35	Pass	0.60	Pass
0032	11:32 am	3.0* $\delta_{0.3g}$	73	20.01	-0.21	-0.22	-1.06	Pass	-1.12	Pass
0033	11:35 am	3.5* $\delta_{0.3g}$	85	23.86	-0.23	-0.28	-0.96	Pass	-1.18	Pass
0034	11:45 am	4.0* $\delta_{0.3g}$	97	28.43	-0.04	-0.29	-0.13	Pass	-1.03	Pass
0035	11:50 am	4.5* $\delta_{0.3g}$	109	32.61	-0.07	-0.19	-0.21	Pass	-0.59	Pass
0036	11:53 am	5.0* $\delta_{0.3g}$	121	36.27	0.06	0.01	0.17	Pass	0.02	Pass
0037	11:56 am	5.5* $\delta_{0.3g}$	133	39.24	0.15	-0.15	0.39	Pass	-0.39	Pass
0038	12:06 pm	6.0* $\delta_{0.3g}$	145	37.03	-0.10	-0.14	-0.28	Pass	-0.38	Pass
0039	12:09 pm	6.5* $\delta_{0.3g}$	157	38.60	0.00	-0.27	-0.01	Pass	-0.71	Pass
0040	12:12 pm	7.0* $\delta_{0.3g}$	169	38.96	-0.15	-0.15	-0.39	Pass	-0.40	Pass
0041	12:16 pm	7.5* $\delta_{0.3g}$	182	42.01	0.07	0.01	0.16	Pass	0.02	Pass
0042	12:20 pm	8.0* $\delta_{0.3g}$	194	44.43	0.01	-0.32	0.03	Pass	-0.72	Pass
0043	12:23 pm	8.5* $\delta_{0.3g}$	206	44.46	0.06	0.03	0.13	Pass	0.07	Pass
0044	12:26 pm	9.0* $\delta_{0.3g}$	218	45.02	-0.14	-0.11	-0.31	Pass	-0.25	Pass
0045	12:30 pm	9.5* $\delta_{0.3g}$	230	46.08	0.01	-0.06	0.02	Pass	-0.14	Pass
0046	12:34 pm	10.0* $\delta_{0.3g}$	242	46.20	-0.04	-0.13	-0.08	Pass	-0.28	Pass
0047	12:37 pm	10.5* $\delta_{0.3g}$	254	49.04	0.14	-0.03	0.29	Pass	-0.05	Pass
0048	12:41 pm	11.0* $\delta_{0.3g}$	266	48.07	-0.07	-0.15	-0.14	Pass	-0.32	Pass
0049	12:43 pm	11.2* $\delta_{0.3g}$	270	48.65	0.10	-0.08	0.20	Pass	-0.16	Pass

Maneuver execution should continue until a steering wheel angle magnitude factor of  $6.5^* \delta_{0.3g, \text{ overall}}$  or 270 degrees is utilized, whichever is greater provided the calculated magnitude of  $6.5^* \delta_{0.3g, \text{ overall}}$  is less than or equal to 300 degrees. If  $6.5^* \delta_{0.3g, \text{ overall}}$  is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of  $0.5^* \delta_{0.3g, \text{ overall}}$  without exceeding the 270 degree steering wheel angle.

### 3.0 TEST DATA....continued

#### DATA SHEET 8 (2 of 3) VEHICLE LATERAL STABILITY AND RESPONSIVENESS 2WD MODE

##### Lateral Stability Test Series No. 2 – Clockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5 min between each test run)	Commanded Steering Wheel Angle <sup>1</sup> (degrees)		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [< 35%]		YRR at 1.75 sec after COS [< 20%]	
		Scalar	Angle	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/Fail	%	Pass/Fail
0050	12:53 pm	1.5* $\delta_{0.3g}$	36	-10.09	0.07	0.07	-0.72	Pass	-0.70	Pass
0051	12:56 pm	2.0* $\delta_{0.3g}$	48	-13.64	0.12	0.27	-0.91	Pass	-1.95	Pass
0052	12:59 pm	2.5* $\delta_{0.3g}$	61	-17.71	-0.10	0.00	0.55	Pass	0.00	Pass
0053	1:03 pm	3.0* $\delta_{0.3g}$	73	-21.80	0.17	0.08	-0.80	Pass	-0.34	Pass
0054	1:06 pm	3.5* $\delta_{0.3g}$	85	-24.05	0.19	0.14	-0.77	Pass	-0.59	Pass
0056	1:12 pm	4.0* $\delta_{0.3g}$	97	-27.36	0.13	0.22	-0.49	Pass	-0.81	Pass
0057	1:27 pm	4.5* $\delta_{0.3g}$	109	-32.74	-0.30	0.15	0.92	Pass	-0.46	Pass
0058	1:30 pm	5.0* $\delta_{0.3g}$	121	-34.25	0.07	0.18	-0.21	Pass	-0.54	Pass
0059	1:34 pm	5.5* $\delta_{0.3g}$	133	-36.52	0.27	0.29	-0.73	Pass	-0.78	Pass
0060	1:37 pm	6.0* $\delta_{0.3g}$	145	-32.99	0.25	0.21	-0.76	Pass	-0.63	Pass
0061	1:40 pm	6.5* $\delta_{0.3g}$	157	-30.79	0.25	0.31	-0.81	Pass	-1.02	Pass
0062	1:44 pm	7.0* $\delta_{0.3g}$	169	-37.60	0.13	-0.01	-0.35	Pass	0.03	Pass
0063	1:47 pm	7.5* $\delta_{0.3g}$	182	-42.15	0.12	0.09	-0.29	Pass	-0.22	Pass
0064	1:50 pm	8.0* $\delta_{0.3g}$	194	-37.17	-0.16	-0.08	0.42	Pass	0.21	Pass
0065	1:54 pm	8.5* $\delta_{0.3g}$	206	-38.15	-0.19	-0.18	0.50	Pass	0.46	Pass
0066	1:56 pm	9.0* $\delta_{0.3g}$	218	-42.70	-0.27	-0.19	0.63	Pass	0.44	Pass
0067	2:00 pm	9.5* $\delta_{0.3g}$	230	-45.24	-0.08	-0.10	0.18	Pass	0.21	Pass
0068	2:03 pm	10.0* $\delta_{0.3g}$	242	-43.35	0.07	0.00	-0.16	Pass	-0.01	Pass
0069	2:06 pm	10.5* $\delta_{0.3g}$	254	-44.94	-0.16	-0.12	0.35	Pass	0.27	Pass
0070	2:10 pm	11.0* $\delta_{0.3g}$	266	-45.68	-0.22	0.19	0.47	Pass	0.41	Pass
0071	2:14 pm	11.2* $\delta_{0.3g}$	270	-48.21	-0.06	0.00	0.13	Pass	0.00	Pass

Maneuver execution should continue until a steering wheel angle magnitude factor of  $6.5 * \delta_{0.3g, overall}$  or 270 degrees is utilized, whichever is greater provided the calculated  $6.5 * \delta_{0.3g, overall}$  is less than or equal to 300 degrees. If  $6.5 * \delta_{0.3g, overall}$  is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of  $0.5 * \delta_{0.3g, overall}$  without exceeding the 270 degree steering wheel angle.

During execution of the sine with dwell maneuvers were any of the following events observed?

Rim-to-pavement contact	_____ Yes	<u>X</u> No
Tire debanding	_____ Yes	<u>X</u> No
Loss of pavement contact of vehicle tires	_____ Yes	<u>X</u> No
Did the test driver experience any vehicle loss of control or spinout?	_____ Yes	<u>X</u> No

If "Yes" explain the event and consult with the COTR. \_\_\_\_\_

\_\_\_\_\_



### 3.0 TEST DATA....continued

#### DATA SHEET 8 (3 of 3) VEHICLE LATERAL STABILITY AND RESPONSIVENESS 2WD MODE

##### Responsiveness – Lateral Displacement

Maneuver #	Initial Steer Direction	Commanded Steering Wheel Angle ( $5.0^* \delta_{0.3g}$ , overall or greater)		Calculated Lateral Displacement <sup>1</sup>	
		Scalar	Angle (degrees)	Distance (m)	Pass/Fail
0036	Counter Clockwise	$5.0^* \delta_{0.3g}$	121	2.51	Pass
0037	Counter Clockwise	$5.5^* \delta_{0.3g}$	133	2.61	Pass
0038	Counter Clockwise	$6.0^* \delta_{0.3g}$	145	2.69	Pass
0039	Counter Clockwise	$6.5^* \delta_{0.3g}$	157	2.68	Pass
0040	Counter Clockwise	$7.0^* \delta_{0.3g}$	169	2.71	Pass
0041	Counter Clockwise	$7.5^* \delta_{0.3g}$	182	2.78	Pass
0042	Counter Clockwise	$8.0^* \delta_{0.3g}$	194	2.84	Pass
0043	Counter Clockwise	$8.5^* \delta_{0.3g}$	206	2.85	Pass
0044	Counter Clockwise	$9.0^* \delta_{0.3g}$	218	2.88	Pass
0045	Counter Clockwise	$9.5^* \delta_{0.3g}$	230	2.86	Pass
0046	Counter Clockwise	$10.0^* \delta_{0.3g}$	242	2.94	Pass
0047	Counter Clockwise	$10.5^* \delta_{0.3g}$	254	2.93	Pass
0048	Counter Clockwise	$11.0^* \delta_{0.3g}$	266	2.97	Pass
0049	Counter Clockwise	$11.2^* \delta_{0.3g}$	270	2.94	Pass
0058	Clockwise	$5.0^* \delta_{0.3g}$	121	2.31	Pass
0059	Clockwise	$5.5^* \delta_{0.3g}$	133	2.45	Pass
0060	Clockwise	$6.0^* \delta_{0.3g}$	145	2.52	Pass
0061	Clockwise	$6.5^* \delta_{0.3g}$	157	2.59	Pass
0062	Clockwise	$7.0^* \delta_{0.3g}$	169	2.66	Pass
0063	Clockwise	$7.5^* \delta_{0.3g}$	182	2.70	Pass
0064	Clockwise	$8.0^* \delta_{0.3g}$	194	2.73	Pass
0065	Clockwise	$8.5^* \delta_{0.3g}$	206	2.79	Pass
0066	Clockwise	$9.0^* \delta_{0.3g}$	218	2.73	Pass
0067	Clockwise	$9.5^* \delta_{0.3g}$	230	2.86	Pass
0068	Clockwise	$10.0^* \delta_{0.3g}$	242	2.88	Pass
0069	Clockwise	$10.5^* \delta_{0.3g}$	254	2.86	Pass
0070	Clockwise	$11.0^* \delta_{0.3g}$	266	2.85	Pass
0071	Clockwise	$11.2^* \delta_{0.3g}$	270	2.90	Pass

1. Lateral displacement should be  $\geq 1.83$  m (6 ft) for vehicles with a GVWR of 3,500 kg (7,716 lb) or less; and  $\geq 1.52$  m (5ft) for vehicles with a GVWR greater than 3,500 kg (7,716 lb).

DATA INDICATES COMPLIANCE:

PASS/FAIL            PASS

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-25-10  
DATE: 10-20-10

### 3.0 TEST DATA....continued

#### DATA SHEET 9 (Sheet 1 of 2) BRAKE AND TIRE CONDITIONING 4WD MODE

**Tire Conditioning Series No. 1** Time: 8:36 AM Date: 08-26-10

Measured Tire Pressures: LF 233 kPa RF 231 kPa  
LR 233 kPa RR 233 kPa

Wind Speed 1.8 m/sec  
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 14.4 °C

30 meter (100 ft) Diameter Circle Maneuver				
Test Runs	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (km/h)
1-3	Clockwise	0.5-0.6	0.55	33.6
4-6	Counterclockwise	0.5-0.6	0.55	32.8

1 Hz 5 Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle For 0.5-0.6g Lateral Acceleration				
Test Runs	Vehicle Speed Km/h(mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1	56±2 (35±1)	30	0.5-0.6	0.31
2	56±2 (35±1)	50	0.5-0.6	0.48
3	56±2 (35±1)	60	0.5-0.6	0.54
4	56±2 (35±1)		0.5-0.6	

Steering wheel angle that corresponds to a peak 0.5–0.6g lateral acceleration; 60 degrees

1 Hz 10 Cycle Sinusoidal Steering Maneuver				
Test Runs	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1 - 3	56±2 (35±1)	60 (cycles 1-10)	0.5-0.6	0.51
4	56±2 (35±1)	60 (cycles 1-9)	0.5-0.6	0.51
		120 (cycle 10)*	N/A	0.76

\* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9.

### 3.0 TEST DATA....continued

#### DATA SHEET 9 (Sheet 2 of 2) BRAKE AND TIRE CONDITIONING 4WD MODE

**Tire Conditioning Series No. 2** Time: 10:47 AM Date: 08-26-10

Measured Tire Pressures: LF 238 kPa RF 234 kPa

LR 238 kPa RR 240 kPa

Wind Speed 2.7 m/sec  
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 18.3 °C

30 meter (100 ft) Diameter Circle Maneuver				
Test Runs	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (km/h)
1-3	clockwise	0.5-0.6	0.55	33.2
4-6	counterclockwise	0.5-0.6	0.55	32.8

1 Hz 5 Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle For 0.5-0.6g Lateral Acceleration				
Test Runs	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1	56±2 (35±1)	30	0.5-0.6	N/A
2	56±2 (35±1)		0.5-0.6	
3	56±2 (35±1)		0.5-0.6	
4	56±2 (35±1)		0.5-0.6	

Steering wheel angle that corresponds to a peak 0.5–0.6g lateral acceleration; 60 degrees

1 Hz 10 Cycle Sinusoidal Steering Maneuver				
Test Runs	Vehicle Speed (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1 - 3	56±2 (35±1)	60 (cycles 1-10)	0.5-0.6	0.51
4	56±2 (35±1)	60 (cycles 1-9)	0.5-0.6	0.51
		120 (cycle 10)*	N/A	0.72

\* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9.

REMARKS:

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-26-10  
DATE: 10-20-10

### 3.0 TEST DATA....continued

#### DATA SHEET 10 (1 of 2) SLOWLY INCREASING STEER (SIS) MANEUVER 4WD MODE

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

VEHICLE NHTSA No.: CA0304 TEST DATE: 08-26-10

Wind Speed 2.2 m/sec  
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 16.1 °C

Static Data File Number: 0005

Selected Drive Configuration: 4WD

Selected Mode: default

#### Preliminary Left Steer Maneuver:

Lateral Acceleration measured at 30 degrees steering wheel angle ( $a_{y,30 \text{ degrees}}$ )

$$a_{y,30 \text{ degrees}} = \underline{0.38} \text{ g}$$

Assuming a linear relationship the following ratio should be used to calculate the steering wheel angle at .55g.

$$\frac{30 \text{ degrees}}{a_{y,30 \text{ degrees}}} = \frac{\delta_{SIS}}{0.55 \text{ g}}$$

$$\delta_{SIS} = \underline{43.4} \text{ degrees @ } 0.55\text{g}$$

$$\delta_{SIS} = \underline{50} \text{ degrees (rounded)}$$

#### Steering Wheel Angle at Corrected 0.3 g Lateral Acceleration:

Maneuver #	Initial Steer Direction	Time Clock (5 min max between runs)	Steering Wheel Angle to nearest 0.1 degree (degrees)	All Conditions Met?
0008	Left	8:55 am	-31.9	Yes
0011	Left	8:58 am	-32.6	Yes
0013	Left	9:03 am	-31.3	Yes
0014	Right	9:09 am	32.1	Yes
0015	Right	9:11 am	32.6	Yes
0025	Right	9:30 am	33.7	Yes

### 3.0 TEST DATA....continued

#### DATA SHEET 10 (2 of 2) SLOWLY INCREASING STEER (SIS) MANEUVER 4WD MODE

##### Average Overall Steering Wheel Angle:

$$\delta_{0.3 \text{ g, overall}} = (|\delta_{0.3 \text{ g, left (1)}}| + |\delta_{0.3 \text{ g, left (2)}}| + |\delta_{0.3 \text{ g, left (3)}}| + \delta_{0.3 \text{ g, right (1)}} + \delta_{0.3 \text{ g, right (2)}} + \delta_{0.3 \text{ g, right (3)}}) / 6$$

$$\delta_{0.3 \text{ g, overall}} = \frac{32.4}{\text{[to nearest 0.1 degree]}} \text{ degrees}$$

REMARKS:

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-26-10  
DATE: 10-20-10

### 3.0 TEST DATA....continued

#### DATA SHEET 11 (1 of 3) VEHICLE LATERAL STABILITY AND RESPONSIVENESS 4WD MODE

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

VEHICLE NHTSA No.: CA0304 TEST DATE: 08-26-10

Tire conditioning completed	<u>X</u>	Yes	<u>        </u>	No
ESC system is enabled	<u>X</u>	Yes	<u>        </u>	No
On track calibration checks have been completed	<u>X</u>	Yes	<u>        </u>	No
On track static data file for each sensor obtained	<u>X</u>	Yes	<u>        </u>	No

Selected Drive Configuration: 4WD  
 Selected Mode: default  
 Overall steering wheel angle ( $\delta_{0.3g, \text{ overall}}$ ) 32.4 degrees  
 Static Data File Number 0027

#### Lateral Stability Test Series No. 1 – Counterclockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5 min between each test run)	Commanded Steering Wheel Angle <sup>1</sup> (degrees)		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [≤ 35%]		YRR at 1.75 sec after COS [≤ 20%]	
		Scalar	Angle	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0\text{sec}}$	$\dot{\psi}_{1.75\text{sec}}$	%	Pass/ Fail	%	Pass/ Fail
0030	1:41 pm	1.5* $\delta_{0.3g}$	49	13.22	-0.12	-0.04	-0.92	Pass	-0.28	Pass
0031	1:59 pm	2.0* $\delta_{0.3g}$	65	17.96	0.06	0.14	0.32	Pass	0.75	Pass
0032	1:57 pm	2.5* $\delta_{0.3g}$	81	23.05	0.10	0.04	0.45	Pass	0.19	Pass
0033	2:05 pm	3.0* $\delta_{0.3g}$	97	28.66	0.35	0.26	1.24	Pass	0.92	Pass
0034	2:08 pm	3.5* $\delta_{0.3g}$	113	32.85	0.48	0.55	1.46	Pass	1.67	Pass
0035	2:12 pm	4.0* $\delta_{0.3g}$	130	38.41	-0.15	-0.18	-0.38	Pass	-0.46	Pass
0036	2:15 pm	4.5* $\delta_{0.3g}$	146	36.96	-0.03	0.12	-0.09	Pass	0.34	Pass
0037	2:18 pm	5.0* $\delta_{0.3g}$	162	35.83	-0.02	-0.05	-0.06	Pass	-0.15	Pass
0038	2:22 pm	5.5* $\delta_{0.3g}$	178	41.61	-0.14	-0.10	-0.33	Pass	-0.25	Pass
0039	2:26 pm	6.0* $\delta_{0.3g}$	194	42.49	0.29	-0.09	0.68	Pass	-0.22	Pass
0040	2:29 pm	6.5* $\delta_{0.3g}$	211	44.82	-0.16	-0.16	-0.36	Pass	-0.36	Pass
0041	2:32 pm	7.0* $\delta_{0.3g}$	227	45.69	-0.06	-0.11	-0.14	Pass	-0.23	Pass
0042	2:35 pm	7.5* $\delta_{0.3g}$	243	47.24	-0.15	0.04	-0.32	Pass	0.08	Pass
0043	2:39 pm	8.0* $\delta_{0.3g}$	259	50.81	0.01	-0.02	0.01	Pass	-0.04	Pass
0044	2:41 pm	8.3* $\delta_{0.3g}$	270	49.90	-0.09	-0.07	-0.18	Pass	-0.14	Pass

Maneuver execution should continue until a steering wheel angle magnitude factor of  $6.5^* \delta_{0.3g, \text{ overall}}$  or 270 degrees is utilized, whichever is greater provided the calculated magnitude of  $6.5^* \delta_{0.3g, \text{ overall}}$  is less than or equal to 300 degrees. If  $6.5^* \delta_{0.3g, \text{ overall}}$  is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of  $0.5^* \delta_{0.3g, \text{ overall}}$  without exceeding the 270 degree steering wheel angle.

### 3.0 TEST DATA....continued

#### DATA SHEET 11 (2 of 3) VEHICLE LATERAL STABILITY AND RESPONSIVENESS 4WD MODE

##### Lateral Stability Test Series No. 2 – Clockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5 min between each test run)	Commanded Steering Wheel Angle <sup>1</sup> (degrees)		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [< 35%]		YRR at 1.75 sec after COS [< 20%]	
		Scalar	Angle	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/Fail	%	Pass/Fail
0045	12:07 pm	1.5* $\delta_{0.3g}$	49	-14.03	0.22	0.05	-1.55	Pass	-0.33	Pass
0046	12:10 pm	2.0* $\delta_{0.3g}$	65	-19.09	0.01	0.23	-0.04	Pass	-1.19	Pass
0047	12:14 pm	2.5* $\delta_{0.3g}$	81	-23.40	-0.08	-0.02	0.35	Pass	0.05	Pass
0048	12:17 pm	3.0* $\delta_{0.3g}$	97	-28.03	-0.23	0.03	0.81	Pass	-0.12	Pass
0049	12:20 pm	3.5* $\delta_{0.3g}$	113	-32.03	-0.48	-0.10	1.49	Pass	0.31	Pass
0050	12:24 pm	4.0* $\delta_{0.3g}$	130	-36.83	0.02	-0.02	-0.05	Pass	0.06	Pass
0051	12:27 pm	4.5* $\delta_{0.3g}$	146	-31.04	-0.15	-0.21	0.49	Pass	0.66	Pass
0052	12:31 pm	5.0* $\delta_{0.3g}$	162	-33.42	-0.06	0.05	0.18	Pass	-0.15	Pass
0053	12:35 pm	5.5* $\delta_{0.3g}$	178	-38.38	0.10	0.19	-0.25	Pass	-0.51	Pass
0054	12:38 pm	6.0* $\delta_{0.3g}$	194	-38.27	-0.04	0.04	0.11	Pass	-0.10	Pass
0055	12:41 pm	6.5* $\delta_{0.3g}$	211	-43.26	0.13	0.10	-0.30	Pass	-0.23	Pass
0056	12:45 pm	7.0* $\delta_{0.3g}$	227	-44.26	0.15	0.12	-0.33	Pass	-0.28	Pass
0058	12:48 pm	7.5* $\delta_{0.3g}$	243	-48.52	-0.21	-0.06	0.44	Pass	0.13	Pass
0059	12:55 pm	8.0* $\delta_{0.3g}$	259	-45.62	0.13	0.09	-0.29	Pass	-0.19	Pass
0060	12:58 pm	8.3* $\delta_{0.3g}$	270	-50.22	0.05	-0.01	-0.10	Pass	0.02	Pass

Maneuver execution should continue until a steering wheel angle magnitude factor of  $6.5^* \delta_{0.3g, overall}$  or 270 degrees is utilized, whichever is greater provided the calculated  $6.5^* \delta_{0.3g, overall}$  is less than or equal to 300 degrees. If  $6.5^* \delta_{0.3g, overall}$  is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of  $0.5^* \delta_{0.3g, overall}$  without exceeding the 270 degree steering wheel angle.

During execution of the sine with dwell maneuvers were any of the following events observed?

Rim-to-pavement contact	_____ Yes	<u>  X  </u> No
Tire debanding	_____ Yes	<u>  X  </u> No
Loss of pavement contact of vehicle tires	_____ Yes	<u>  X  </u> No
Did the test driver experience any vehicle loss of control or spinout?	_____ Yes	<u>  X  </u> No

If "Yes" explain the event and consult with the COTR. \_\_\_\_\_

\_\_\_\_\_

### 3.0 TEST DATA....continued

#### DATA SHEET 11 (3 of 3) VEHICLE LATERAL STABILITY AND RESPONSIVENESS 4WD MODE

##### Responsiveness – Lateral Displacement

Maneuver #	Initial Steer Direction	Commanded Steering Wheel Angle ( $5.0^* \delta_{0.3g}$ overall or greater)		Calculated Lateral Displacement <sup>1</sup>	
		Scalar	Angle (degrees)	Distance (m)	Pass/Fail
0037	Counter Clockwise	$5.0^* \delta_{0.3g}$	162	2.76	Pass
0038	Counter Clockwise	$5.5^* \delta_{0.3g}$	178	2.78	Pass
0039	Counter Clockwise	$6.0^* \delta_{0.3g}$	194	2.83	Pass
0040	Counter Clockwise	$6.5^* \delta_{0.3g}$	211	2.88	Pass
0041	Counter Clockwise	$7.0^* \delta_{0.3g}$	227	2.87	Pass
0042	Counter Clockwise	$7.5^* \delta_{0.3g}$	243	2.94	Pass
0043	Counter Clockwise	$8.0^* \delta_{0.3g}$	259	2.95	Pass
0044	Counter Clockwise	$8.3^* \delta_{0.3g}$	270	3.00	Pass
0052	Clockwise	$5.0^* \delta_{0.3g}$	162	2.62	Pass
0053	Clockwise	$5.5^* \delta_{0.3g}$	178	2.63	Pass
0054	Clockwise	$6.0^* \delta_{0.3g}$	194	2.68	Pass
0055	Clockwise	$6.5^* \delta_{0.3g}$	211	2.77	Pass
0056	Clockwise	$7.0^* \delta_{0.3g}$	227	2.82	Pass
0058	Clockwise	$7.5^* \delta_{0.3g}$	243	2.88	Pass
0059	Clockwise	$8.0^* \delta_{0.3g}$	259	2.86	Pass
0060	Clockwise	$8.3^* \delta_{0.3g}$	270	2.89	Pass

1. Lateral displacement should be  $\geq 1.83$  m (6 ft) for vehicles with a GVWR of 3,500 kg (7,716 lb) or less; and  $\geq 1.52$  m (5ft) for vehicles with a GVWR greater than 3,500 kg (7,716 lb).

DATA INDICATES COMPLIANCE:

PASS/FAIL            PASS           

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-26-10  
DATE: 10-20-10



### 3.0 TEST DATA....continued

#### DATA SHEET 12 (Sheet 1 of 2) MALFUNCTION WARNING TEST

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

VEHICLE NHTSA No.: CA0304 TEST DATE: 09-14-10

#### METHOD OF MALFUNCTION SIMULATION:

Describe method of malfunction simulation: Disconnect the Left Front wheel speed sensor connector.

#### MALFUNCTION TELLTALE ILLUMINATION:

Telltale illuminates and remains illuminated after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes.

X Yes        No

Time for telltale to illuminate after ignition system is activated.

1 Seconds (must be within 2 minutes)

X Pass        Fail

#### ESC SYSTEM RESTORATION:

Telltale extinguishes after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes.

X Yes        No

Time for telltale to extinguish after ignition system is activated and vehicle speed of  $48 \pm 8$  km/h ( $30 \pm 5$  mph) is reached.

1 Second (must be within 2 minutes)

X Pass        Fail

DATA INDICATES COMPLIANCE:

PASS/FAIL PASS

#### REMARKS:

The vehicle did not require driving to illuminate or extinguish the malfunction telltale. When the wheel speed sensor was disconnected, the ESC, ABS, ESP BAS, and SERV 4WD malfunction telltales illuminated. When the wheel speed sensor connection was restored, the ESC, ABS, ESP BAS, and SERV 4WD malfunction telltales extinguished.

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 09-14-10  
DATE: 10-20-10

### 3.0 TEST DATA....continued

#### DATA SHEET 12 (Sheet 2 of 2) MALFUNCTION WARNING TEST

VEHICLE MAKE/MODEL/BODY STYLE: Jeep / Liberty / MPV

VEHICLE NHTSA No.: CA0304 TEST DATE: 09-14-10

#### METHOD OF MALFUNCTION SIMULATION:

Describe method of malfunction simulation: Disconnect the KK sensor cluster connector located underneath the center console.

#### MALFUNCTION TELLTALE ILLUMINATION:

Telltale illuminates and remains illuminated after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes.

X Yes        No

Time for telltale to illuminate after ignition system is activated.

1 Seconds (must be within 2 minutes)

X Pass        Fail

#### ESC SYSTEM RESTORATION:

Telltale extinguishes after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes.

X Yes        No

Time for telltale to extinguish after ignition system is activated.

1 Second (must be within 2 minutes)

X Pass        Fail

DATA INDICATES COMPLIANCE:

PASS/FAIL PASS

#### REMARKS:

The vehicle did not require driving to illuminate or extinguish the malfunction telltale. When the KK sensor cluster was disconnected, the ESC, ESP BAS, and SERV 4WD malfunction telltales illuminated. When the KK sensor connection was restored, the ESC, ESP BAS, and SERV 4WD malfunction telltales extinguished.

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 09-14-10  
DATE: 10-20-10

#### 4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

Type	Output	Range	Resolution	Accuracy	Specifics	Serial Number	Calibration
Tire Pressure Gauge	Vehicle Tire Pressure	0-60psi	0.5 psi	±0.5% of applied pressure	Moroso Model: 89562 0-60psi	<u>N/A</u>	By: <u>TRC</u> Date: <u>6-30-10</u> Due: <u>9-30-10</u>
Platform Scales	Vehicle Total, Wheel, and Axle Load	0-2500 lb per each of four pads	0.5 lb	±1.0% of applied load	Mettler Toledo Model: JXGA1000	<u>5225831-5JC</u>	By: <u>Mettler Toledo</u> Date: <u>8-25-10</u> Due: <u>11-25-10</u>
Automated Steering Machine with Steering Angle Encoder	Handwheel Angle	±800 deg	0.25 deg	±0.25 deg	Heitz Automotive Testing Model: Sprint 3	<u>60303</u>	By: <u>ATI-Heitz</u> Date: <u>1-05-10</u> Due: <u>1-05-11</u>
Multi-Axis Inertial Sensing System	Longitudinal, Lateral, and Vertical Acceleration  Roll, Yaw, and Pitch Rate	Accelerometers: ±2 g  Angular Rate Sensors: ±100 deg/s	Accelerometers: ≤10 ug  Angular Rate Sensors: ≤0.004 deg/s	Accelerometers: ≤0.05% of full range  Angular Rate Sensors: 0.05% of full range	BEI Technologies  Model: MotionPAK MP-1	<u>0768</u>	By: <u>BEI Tech.</u> Date: <u>1-14-10</u> Due: <u>1-14-11</u>
Radar Speed Sensor and Dashboard Display	Vehicle Speed	0-125 mph	0.009 mph	±0.25% of full scale	A-DAT Corp. Radar Model: DRS-6 Display Model: RD-2	<u>1400603</u>	By: <u>A-DAT</u> Date: <u>12-16-09</u> Due: <u>12-16-10</u>
Ultrasonic Distance Measuring System	Left and Right Side Vehicle Height	5-24 inches	0.01 inches	±0.25% of maximum distance	Massa Products Corporation Model: M-5000/220	<u>104619</u> & <u>104613</u>	By: <u>Consumers Energy Laboratory Services</u> Date: <u>12-18-09</u> Due: <u>12-18-10</u>
Data Acquisition System [Amplify, Anti-Alias, and Digitize]	Record Time; Velocity; Distance; Lateral, Longitudinal, and Vertical Accelerations; Roll, Yaw, and Pitch Rates; Steering Wheel Angle.	Sufficient to meet or exceed individual sensors	200 Hz	Sufficient to meet or exceed individual sensors	Dewetron Sidehand DAS Model: DA-121-16 Digitizer Model: Dewe-Orion-1616-100 Amplifier/AntiAliasing: MDAQ-FILT-10-S	<u>12060</u> <u>1105</u>	By: <u>Dewetron</u> Date: <u>7-01-09</u> Due: <u>7-01-10*</u>
Load Cell	Vehicle Brake Pedal Force	0-300 lb	1 lb	±0.05% of full scale	DATRON Model: DTM-LPA	<u>4970-1103</u>	By: <u>TRC</u> Date: <u>per test</u> Due: <u>per test</u>
Coordinate Measurement Machine	Inertial Sensing System Location	0-10 feet	0.001 inch	±0.003% of full scale	FARO International Model: Faro Arm N10	<u>N10-02-03-01310</u>	By: <u>FARO</u> Date: <u>9-01-09</u> Due: <u>9-01-10</u>
Outriggers	No output. Safety Item.	N/A	N/A	N/A	NHTSA Titanium Outriggers Model: Docket 2007-27662-11	N/A	N/A

\*The Dewetron data acquisition system calibration due date was extended to 9/17/10, per OVSC.

## **5.0      PHOTOGRAPHS**

- 5.1      ¾ FRONT VIEW FROM LEFT SIDE OF VEHICLE
- 5.2      ¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE
- 5.3      VEHICLE CERTIFICATION LABEL
- 5.4      TIRE AND LOADING INFORMATION LABEL
- 5.5      WINDOW STICKER (MONRONEY LABEL)
- 5.6      ESC MALFUNCTION AND ESC OFF TELLTALE
- 5.7      ESC MALFUNCTION TELLTALE
- 5.8      ESC OFF MESSAGE
- 5.9      PARTIAL ESC OFF CONTROL
- 5.10     ESC OFF ANCILLARY CONTROL
- 5.11     ¾ FRONT VIEW - TEST VEHICLE INSTRUMENTED
- 5.12     RIGHT SIDE VIEW – TEST VEHICLE INSTRUMENTED
- 5.13     STEERING WHEEL CONTROLLER AND DATA ACQUISITION SYSTEM
- 5.14     STEERING CONTROLLER BATTERY BOX
- 5.15     INERTIA MEASUREMENT UNIT
- 5.16     VEHICLE SPEED SENSOR
- 5.17     BODY ROLL SENSOR (DRIVER SIDE)
- 5.18     BODY ROLL SENSOR (PASSENGER SIDE)
- 5.19     BRAKE PEDAL FORCE TRANSDUCER





2010 JEEP LIBERTY SPORT 4X4  
FMVSS 126  
VEHICLE No.: CA0304  
AUGUST 2010

5.1 ¾ FRONT VIEW FROM LEFT SIDE OF VEHICLE





2010 JEEP LIBERTY SPORT 4X4  
FMVSS 126  
VEHICLE No.: CA0304  
AUGUST 2010

5.2 ¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE



MFD BY CHRYSLER GROUP LLC

DATE OF MFR: 6-10

GVWR:

GVWR FRONT: 1248 KG 2750 LB WITH

16X7.0

RIMS AT

GVWR REAR: 1452 KG 3200 LB WITH

16X7.0

RIMS AT

2541 KG 5600 LB

P235/70R16

TIRES

228 KPA ( 33 PSI) COLD

P235/70R16

TIRES

228 KPA ( 33 PSI) COLD



THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S.A. FEDERAL MOTOR VEHICLE SAFETY AND THEFT PREVENTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

VIN: 1J4PN2GK1AW179502 TYPE: MPV

MDH:061105 036AB

TRIM: K7DU

VEHICLE MADE IN U.S.A. PAINT: PBS

2010 JEEP LIBERTY SPORT 4X4

FMVSS 126

VEHICLE No.: CA0304

AUGUST 2010

5.3 VEHICLE CERTIFICATION LABEL





**TIRE AND LOADING INFORMATION**

SEATING CAPACITY – TOTAL **5** FRONT **2** REAR **3**

THE COMBINED WEIGHT OF OCCUPANTS AND CARGO SHOULD NEVER EXCEED

430 KG OR 950 LB

TIRE	FRONT	REAR	SPARE
ORIGINAL TIRE SIZE	P235/70R16	P235/70R16	P235/70R16
COLD TIRE INFLATION PRESSURE	228 kPa / 33 PSI	228 kPa / 33 PSI	228 kPa / 33 PSI

SEE OWNERS MANUAL FOR ADDITIONAL INFORMATION



**AW179502**

2010 JEEP LIBERTY SPORT 4X4  
FMVSS 126  
VEHICLE No.: CA0304  
AUGUST 2010



# Jeep® 2010 MODEL YEAR LIBERTY SPORT 4X4

For more information visit: [www.jeep.com](http://www.jeep.com)  
or call 1-877-1AM-JEEP

Chrysler Group LLC

THIS VEHICLE IS MANUFACTURED TO MEET SPECIFIC UNITED STATES REQUIREMENTS. THIS VEHICLE IS NOT MANUFACTURED FOR SALE OR REGISTRATION OUTSIDE OF THE UNITED STATES.

MANUFACTURER'S SUGGESTED RETAIL PRICE OF THIS MODEL INCLUDING DEALER PREPARATION

Base Price: \$24,865

## 2010 JEEP LIBERTY SPORT 4X4

Exterior Color: Deep Water Blue Pearl Coat Exterior Paint  
Interior Color: Dark Slate Gray Interior Color  
Engine: 3.7-Liter V6 Engine  
Transmission: 4-Speed Automatic Transmission

### STANDARD EQUIPMENT (UNLESS REPLACED BY OPTIONAL EQUIPMENT)

#### FUNCTIONAL/SAFETY FEATURES

Brake Assist  
Electronic Stability Program  
Electronic Roll Mitigation  
Hill Start Assist  
All Speed Traction Control  
Anti-lock 4-Wheel Disc Brakes  
Active Head Restraints  
Advanced Multistage Front Airbags  
LATCH-Ready Child Seat Anchor System  
Supplemental Side-Curtain Front and Rear Airbags  
Command-Trac II Part-Time 4WD System  
19.5-Gallon Fuel Tank  
Compact Spare Tire  
Enhanced Accident Response System  
Power Windows with Driver's One-Touch-Down Feature  
Rear Window Wiper / Washer  
Try Key Theft Deterrent System  
Air Control Glass  
Pressure Monitoring Lamp  
INTERIOR FEATURES  
Air Conditioning  
Cabin Air Filtration System  
Stain Repel - Stain/odor/Static Resistant Fabric  
Front Passenger-Side Fold-Flat Seat  
Rear 60 / 40 Split-Folding Reclining Seat  
Media Center 130 CD/MP3 Radio  
Audio Jack Input for Mobile Devices  
SIRIUS Satellite Radio  
1-Year SIRIUS Radio Service  
For More Information, Call 1-888-538-7474  
Remote Keyless Entry  
Sun Visors with Illuminated Vanity Mirrors  
Tilt Steering Column  
Rearview Day / Night Mirror  
Headlamps with Turn-Off Time Delay

39

TOTAL PRICE: \* \$26,965

### WARRANTY COVERAGE

5-year or 100,000-mile Powertrain Limited Warranty.  
3-year or 36,000-mile Basic Limited Warranty.  
24-hour towing assistance; certain restrictions apply.  
Ask Dealer for a copy of the limited warranties or see your owner's manual for details.

5 Year / 100,000 MILE  
POWERTRAIN WARRANTY

Full-Length Floor Console  
Reversible / Waterproof Cargo Storage  
Auxiliary 12-Volt Power Outlet  
Luxury Front and Rear Floor Mats

### EXTERIOR FEATURES

16" x 7.0" Cast Aluminum Painted Sparkle Silver  
P225/70R16 BSW All Season Tires  
Power Heated Exterior Mirrors w/ Manual Fold-Away  
Tinted Windshield Glass  
Automatic Headlamps  
Halogen Headlamps  
Flipper Lipgate Glass

### OPTIONAL EQUIPMENT

Deep Water Blue Pearl Coat Exterior Paint \$225  
Customer Preferred Package 288 \$850  
Power Sunroof \$280  
Map Lights  
P235/70R16 OWL All Terrain Tires  
Full-Size Spare Tire  
Black Steel Spare Wheel

### DESTINATION CHARGE

\$745

## EPA Fuel Economy Estimates

These estimates reflect new EPA methods beginning with 2008 models.

CITY MPG  
**15**

Expected range for most drivers  
12 to 18 MPG

Estimated  
Annual Fuel Cost  
**\$2,293**

based on 15,000 miles  
at \$2.80 per gallon

### Combined Fuel Economy

This vehicle

17

10 ————— 32  
All SUVs

HIGHWAY MPG  
**21**

Expected range for most drivers  
17 to 25 MPG

Your actual mileage will vary depending on how you drive and maintain your vehicle.

See the FREE Fuel Economy Guide at dealers or [www.fueleconomy.gov](http://www.fueleconomy.gov)

## GOVERNMENT SAFETY RATINGS

Frontal Crash ★★★★★  
Driver ★★★★★  
Passenger ★★★★★

Star ratings based on the risk of injury in a frontal impact. Frontal ratings should ONLY be compared to other vehicles of similar size and weight.

Side Crash ★★★★★  
Front seat ★★★★★  
Rear seat ★★★★★

Star ratings based on the risk of injury in a side impact.

Rollover ★★★  
Star ratings based on the risk of rollover in a single vehicle crash.

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA).

[www.safercar.gov](http://www.safercar.gov) or 1-888-327-4236

The safety ratings above are based on Federal Government tests of particular vehicles equipped with certain features and options. The performance of this vehicle may differ.

## PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:  
U.S./CANADIAN PARTS CONTENT: 80 %  
NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

## FOR THIS VEHICLE:

FINAL ASSEMBLY POINT:  
TOLEDO, OHIO, U.S.A.  
COUNTRY OF ORIGIN:  
ENGINE: UNITED STATES  
TRANSMISSION: UNITED STATES

2010 JEEP LIBERTY SPORT 4X4  
FMVSS 126  
VEHICLE No.: CA0304  
AUGUST 2010

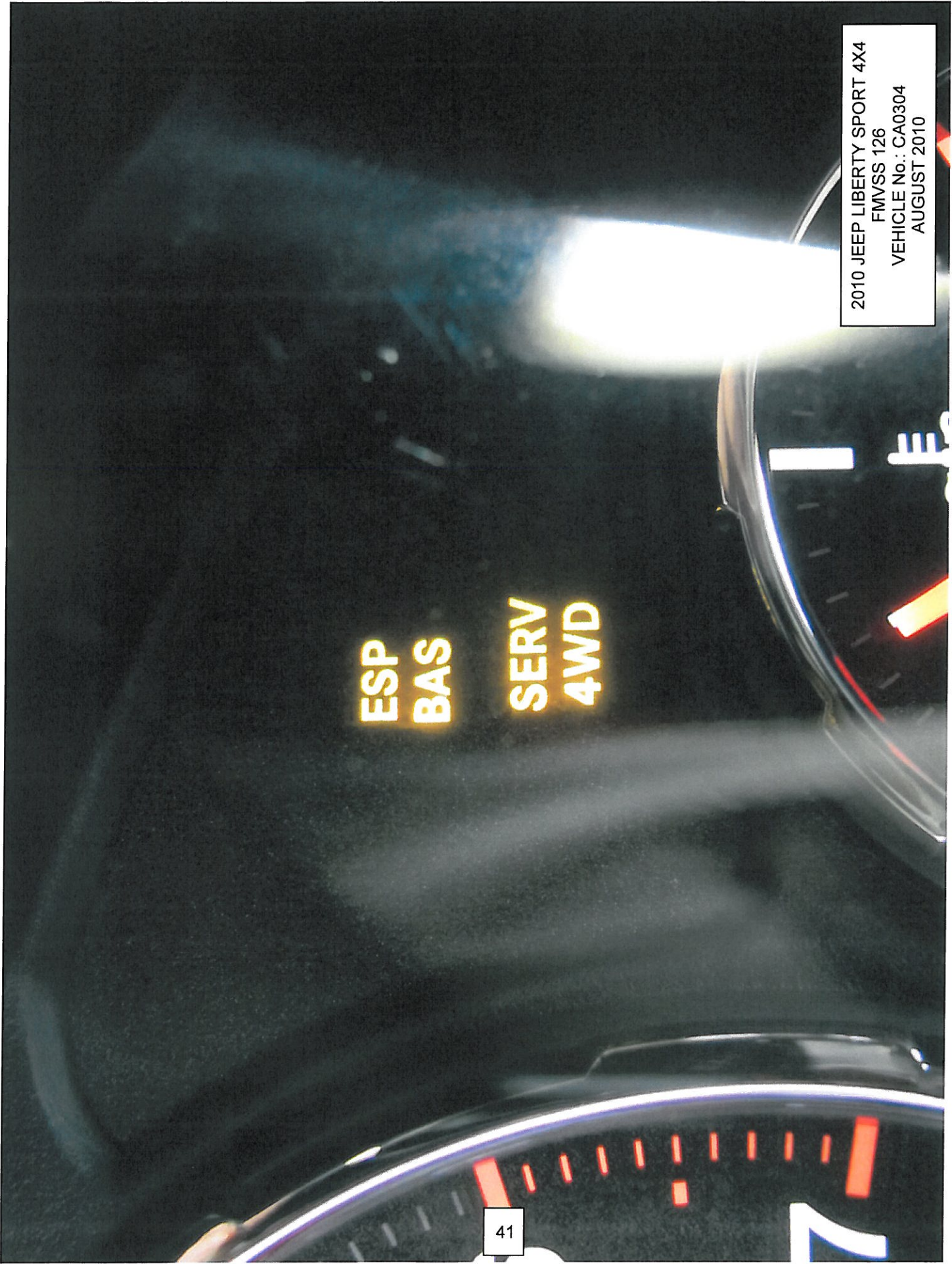
5.5 WINDOW STICKER - MONRONEY LABEL



2010 JEEP LIBERTY SPORT 4X4  
FMVSS 126  
VEHICLE No.: CA0304  
AUGUST 2010

5.6 ESC MALFUNCTION AND ESC OFF TELLTALE

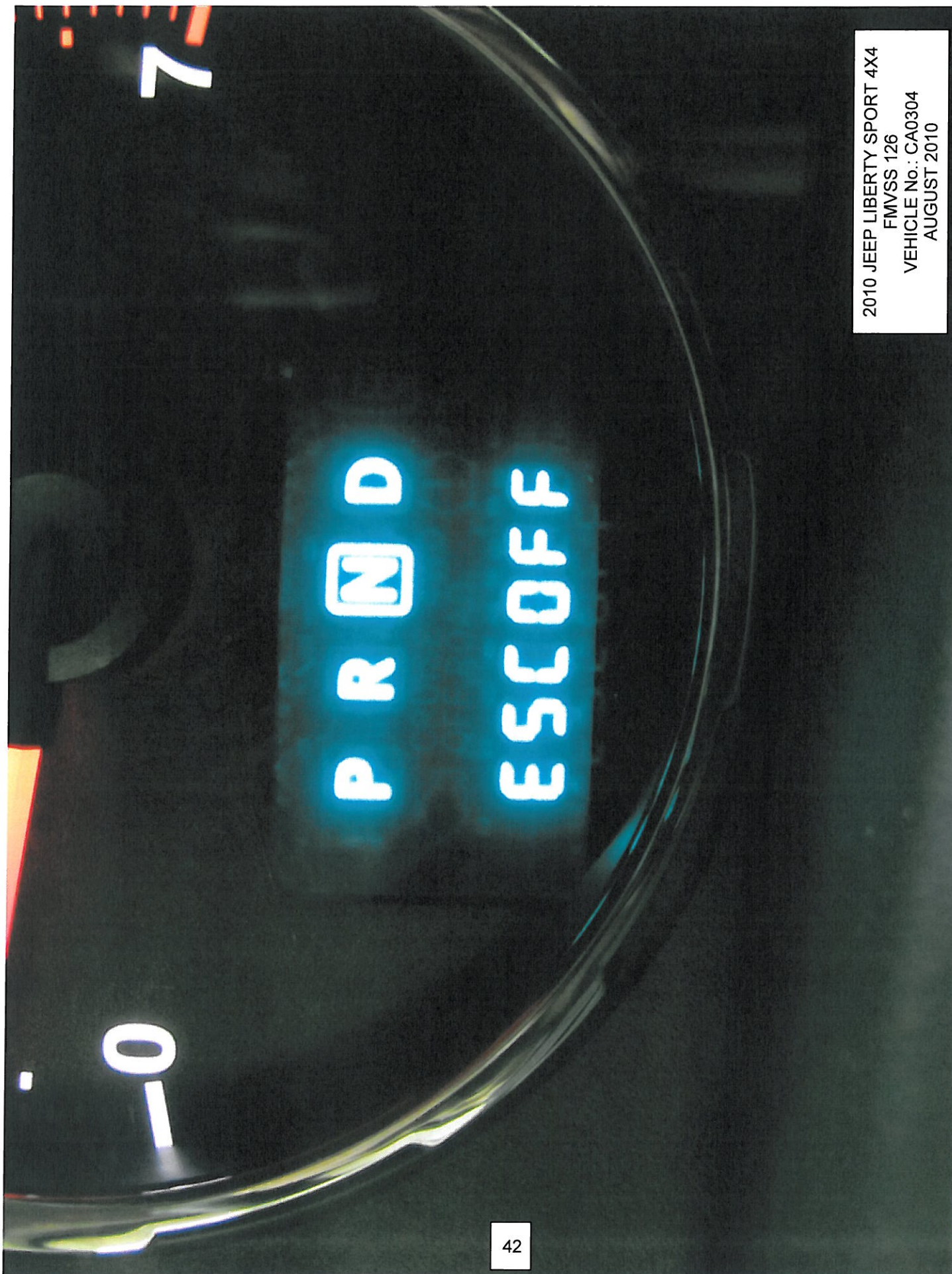




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5.7 ESC MALFUNCTION TELLTALE





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5.8 ESC OFF MESSAGE





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5.9 PARTIAL ESC OFF CONTROL





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5.10 ESC OFF ANCILLARY CONTROL









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5.12 RIGHT SIDE VIEW - TEST VEHICLE INSTRUMENTED





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5.13 STEERING WHEEL CONTROLLER AND DATA ACQUISITION SYSTEM



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5.14 STEERING CONTROLLER BATTERY BOX





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5.15 INERTIA MEASUREMENT UNIT





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5.16 VEHICLE SPEED SENSOR





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5.17 BODY ROLL SENSOR (DRIVER SIDE)





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5.18 BODY ROLL SENSOR (PASSENGER SIDE)





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5.19 BRAKE PEDAL FORCE TRANSDUCER

## 6.0 DATA PLOTS

### 2WD Mode

Figure 1. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests

Figure 2. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Counter-Clockwise Initial Steer Tests

Figure 3. Steering Angle and Yaw Rate Time History, Clockwise Initial Steer Tests

Figure 4. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests

### 4WD Mode

Figure 5. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests

Figure 6. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Counter-Clockwise Initial Steer Tests

Figure 7. Steering Angle and Yaw Rate Time History, Clockwise Initial Steer Tests

Figure 8. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests



Figure 1. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests

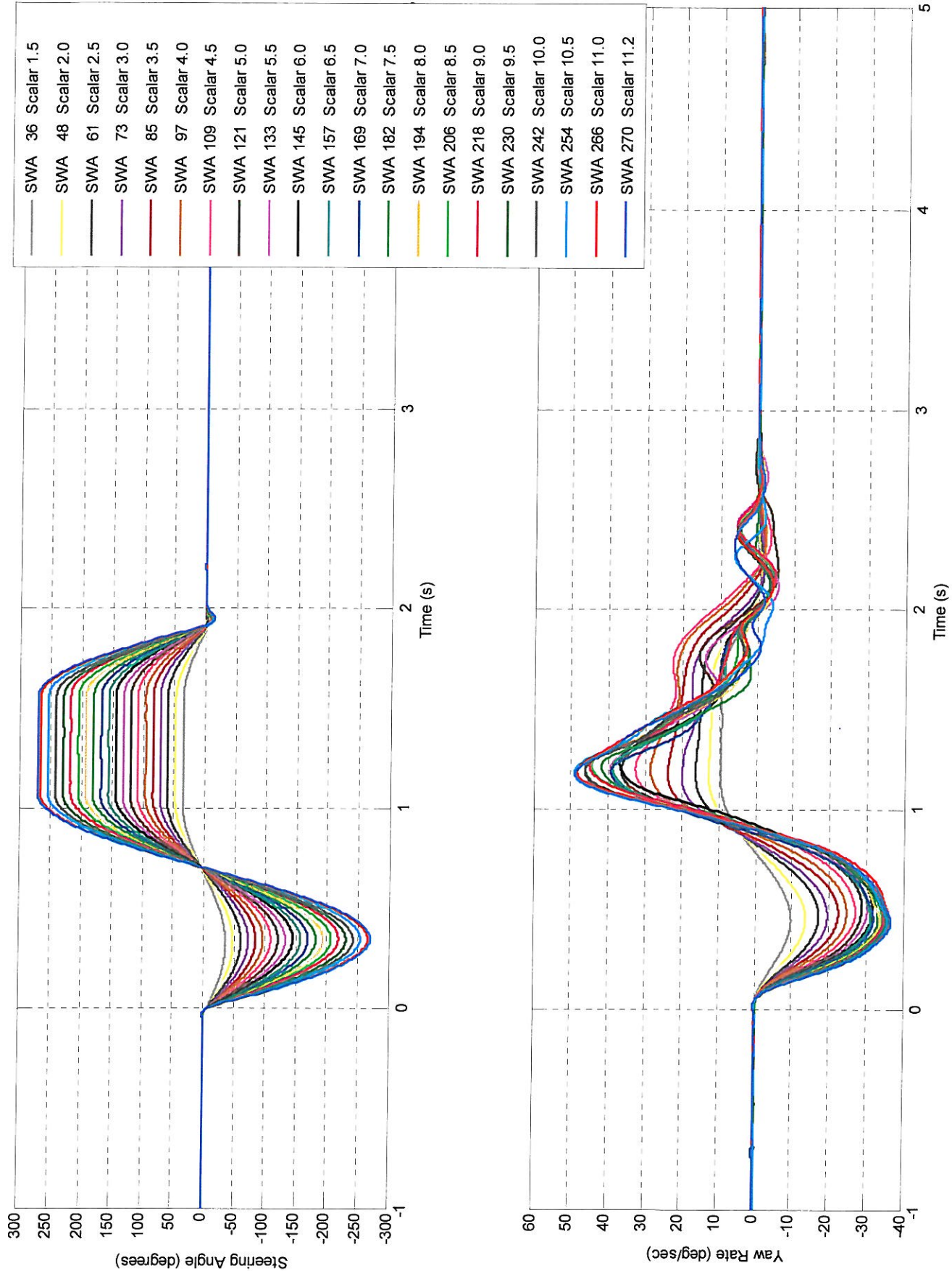


Figure 2. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Counter-Clockwise Initial Steer Tests

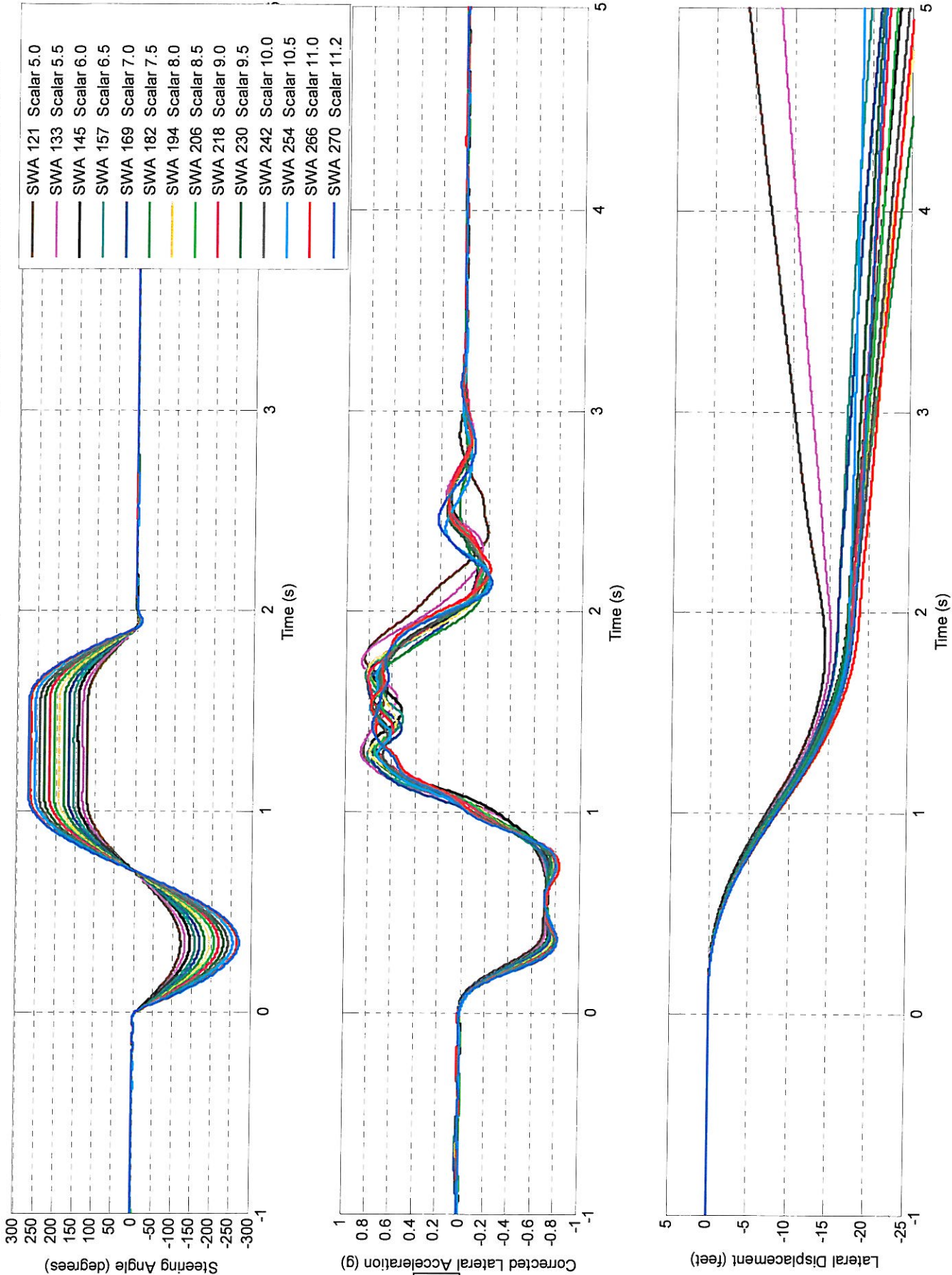


Figure 3. Steering Angle and Yaw Rate Time History, Clockwise Initial Steer Tests

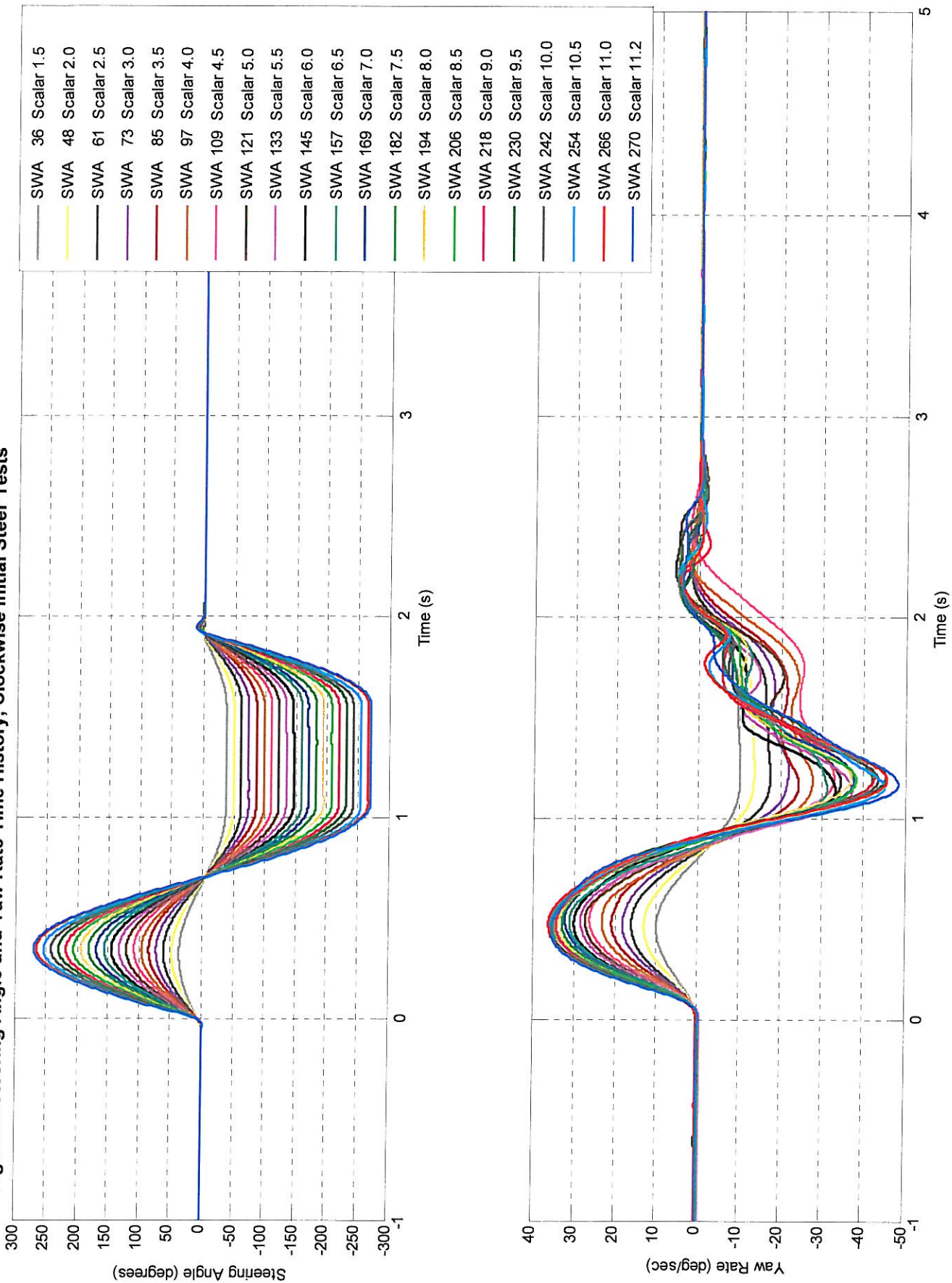




Figure 4. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests

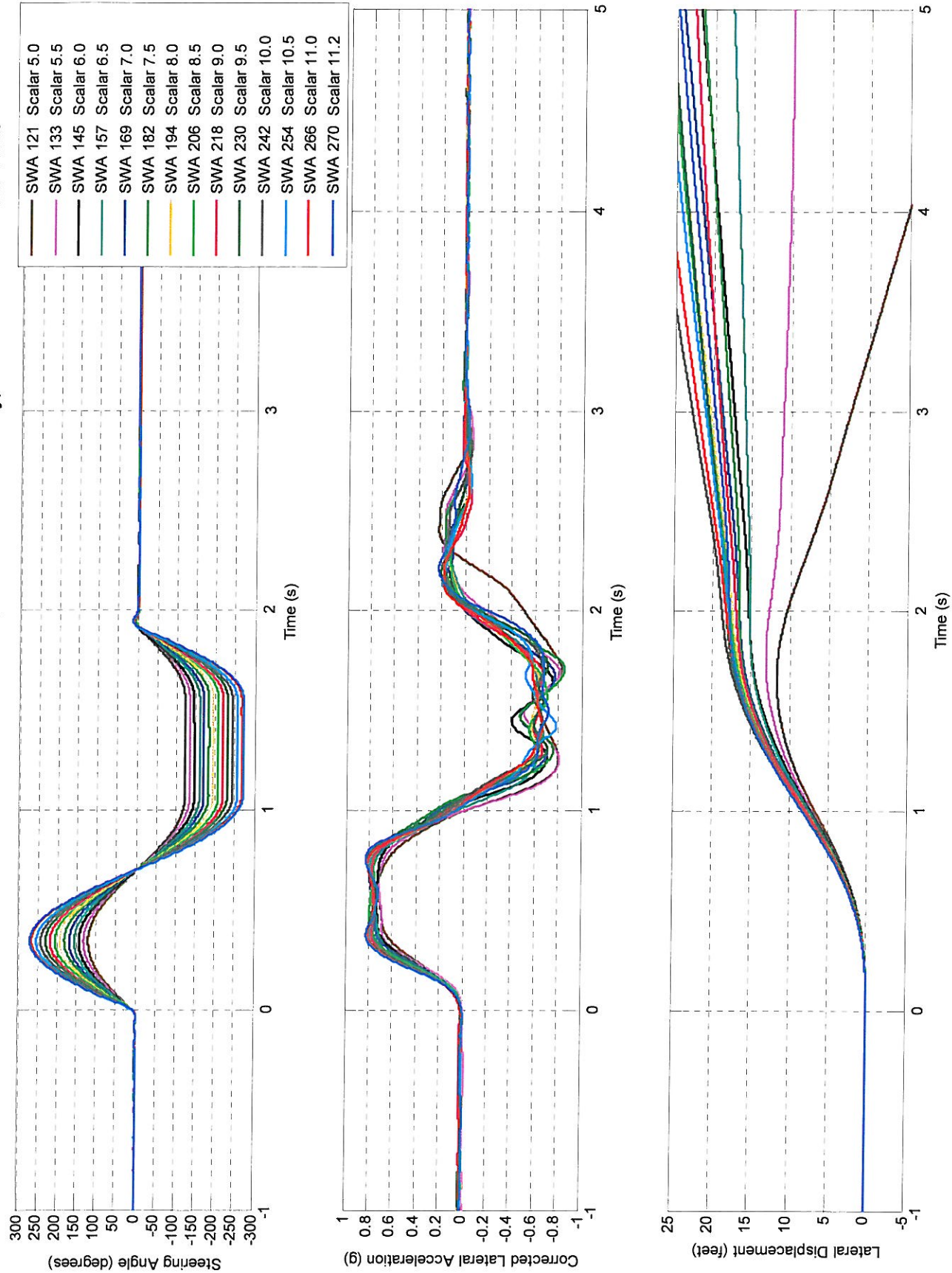


Figure 5. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests

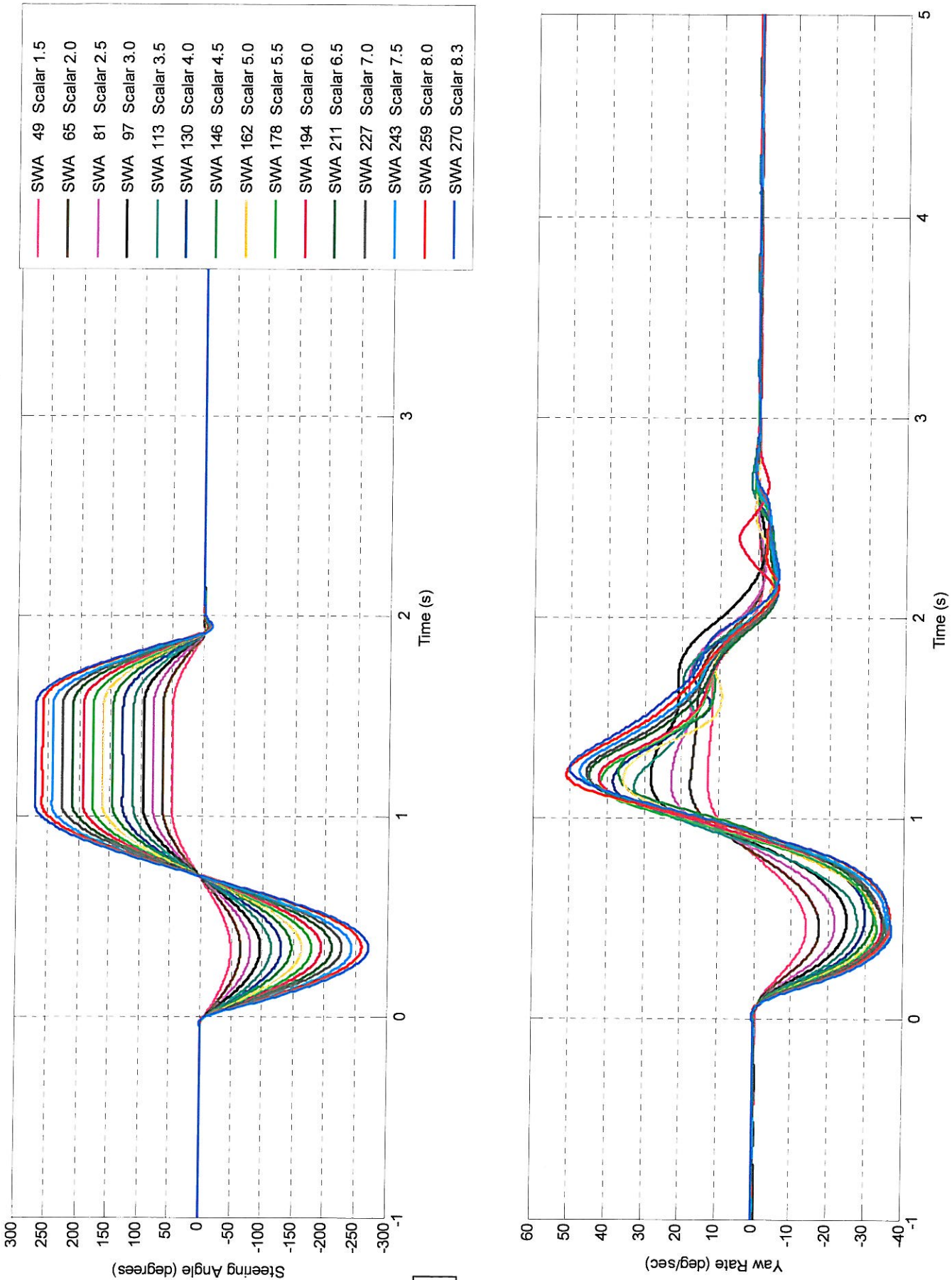


Figure 6. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Counter-Clockwise Initial Steer Tests

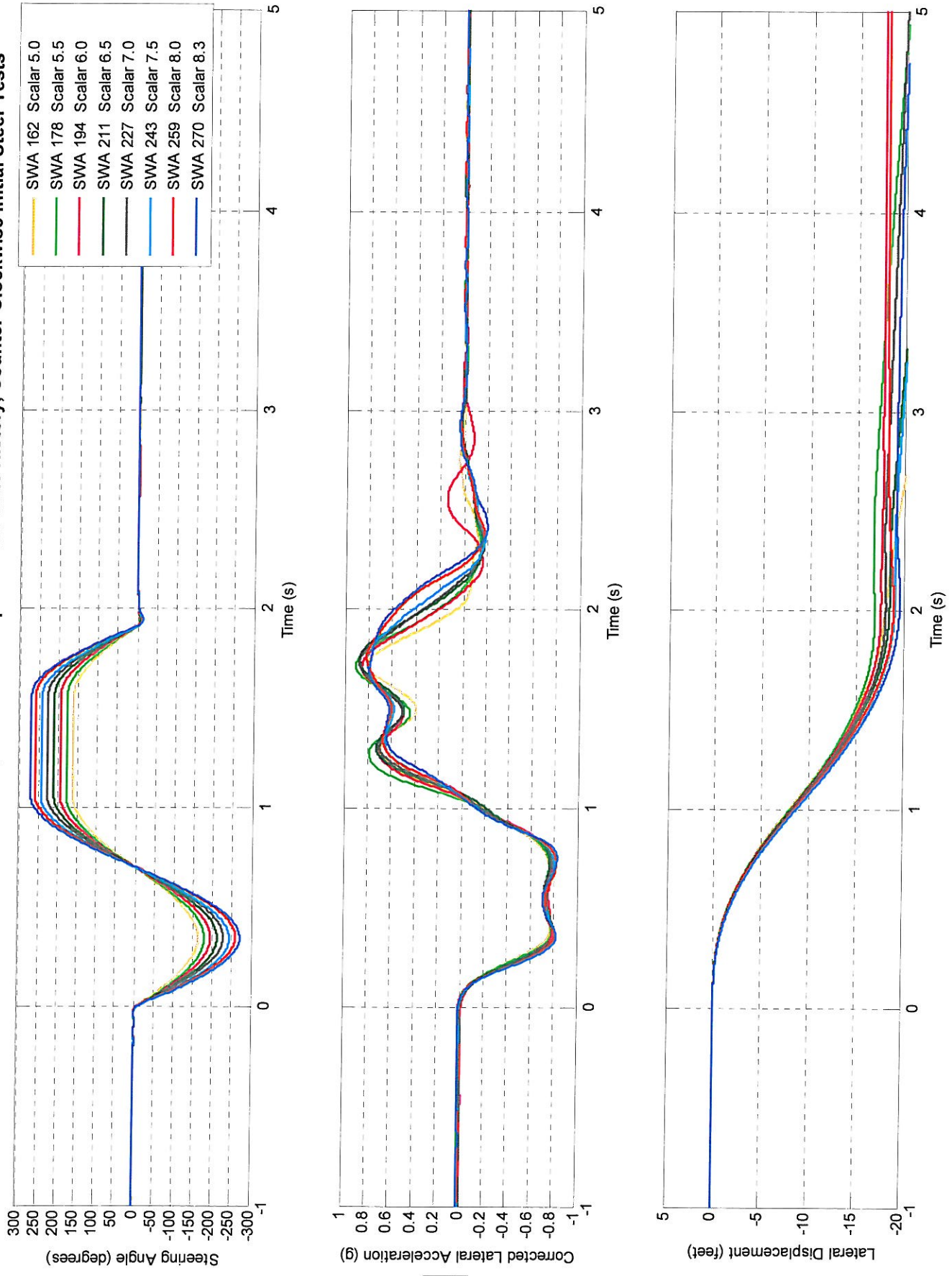




Figure 7. Steering Angle and Yaw Rate Time History, Clockwise Initial Steer Tests

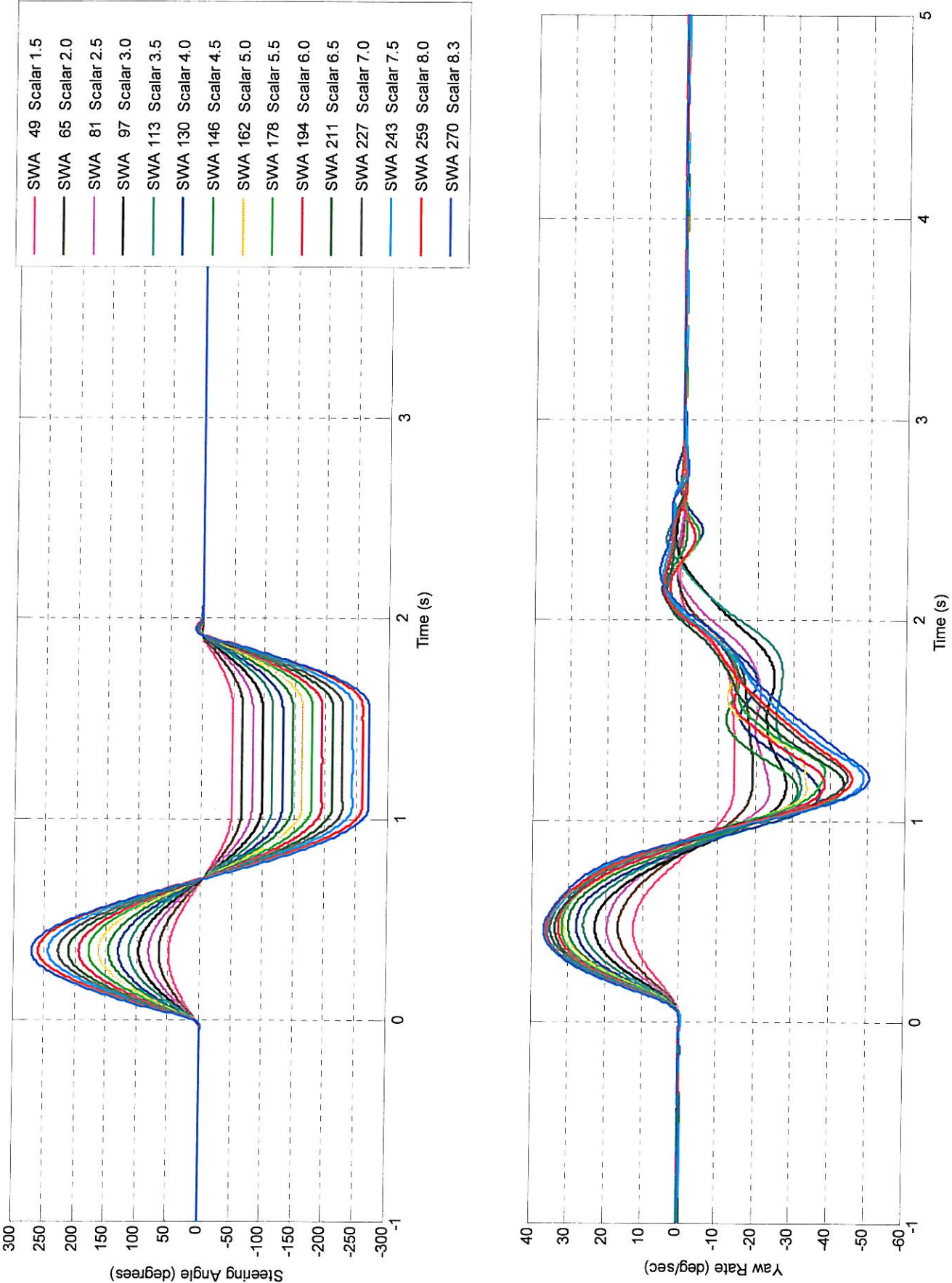
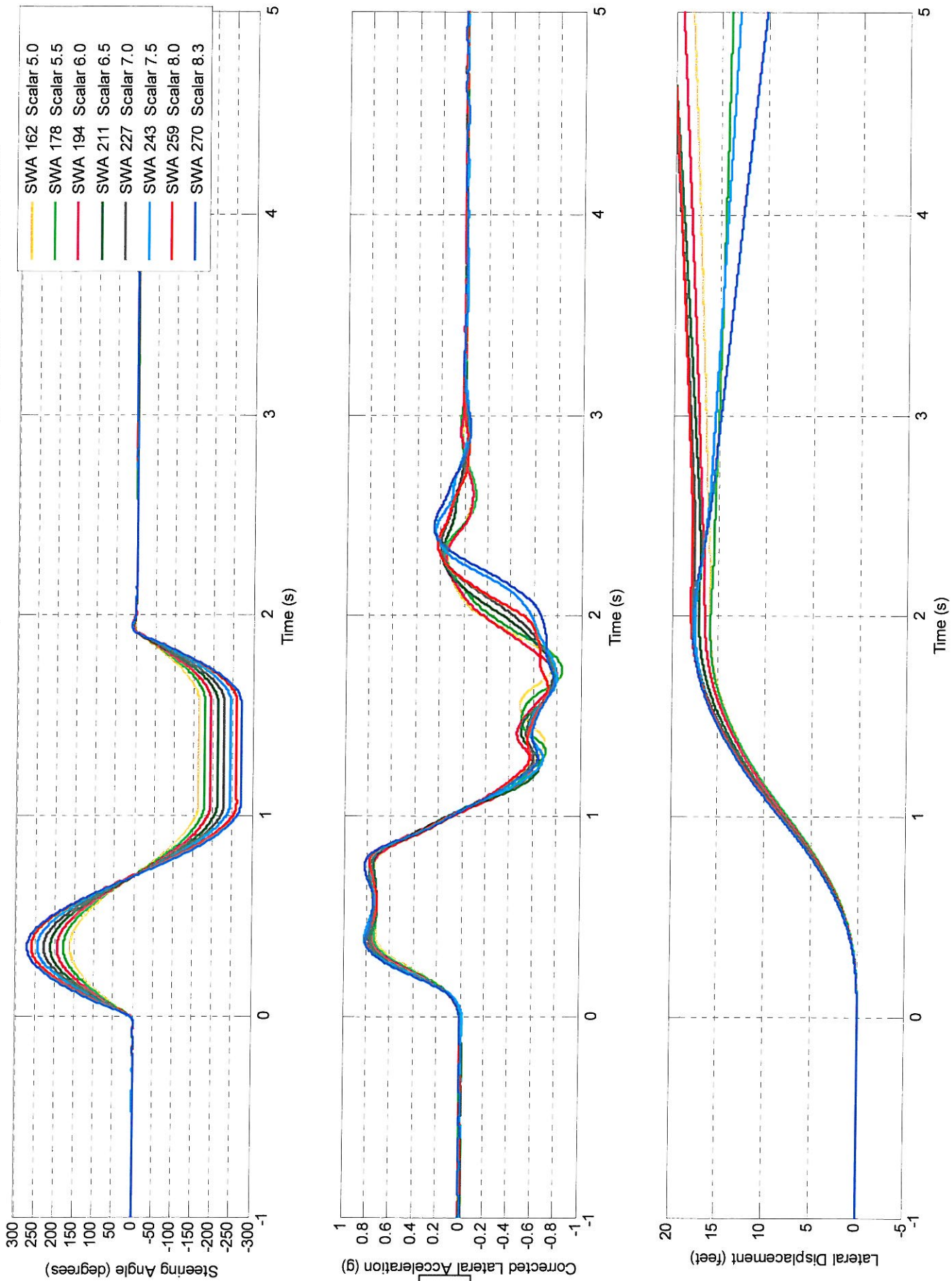


Figure 8. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests

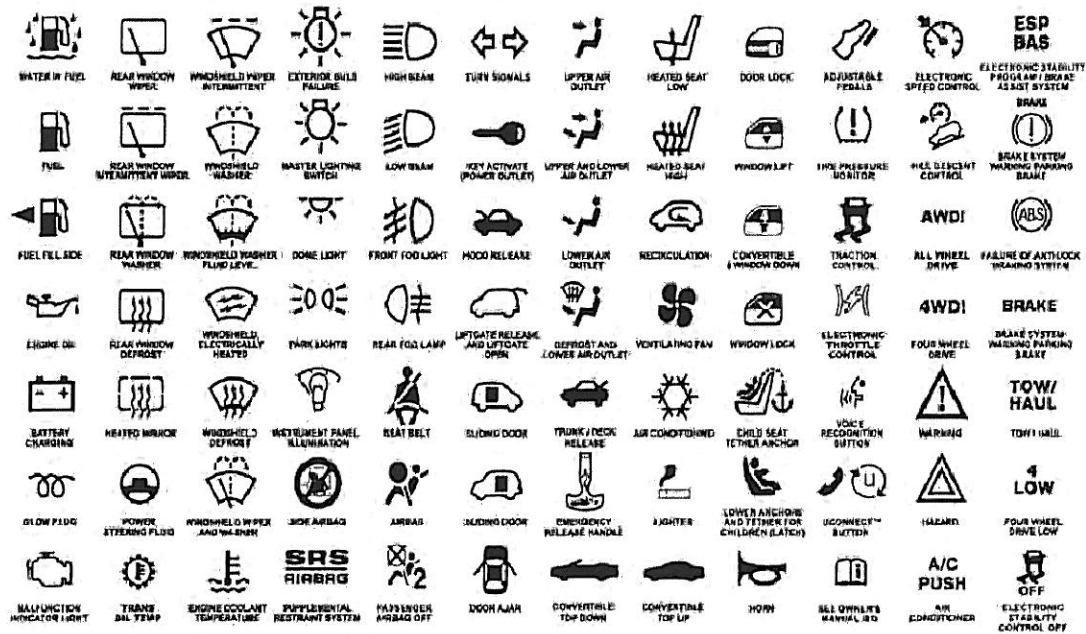




## **7.0 OTHER DOCUMENTATION**

- 7.1 OWNER'S MANUAL PAGES
- 7.2 VEHICLE ARRIVAL CONDITION REPORT
- 7.3 VEHICLE COMPLETION CONDITION REPORT
- 7.4 SINE WITH DWELL TEST RESULTS
- 7.5 SLOWLY INCREASING STEER TEST RESULTS
- 7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES

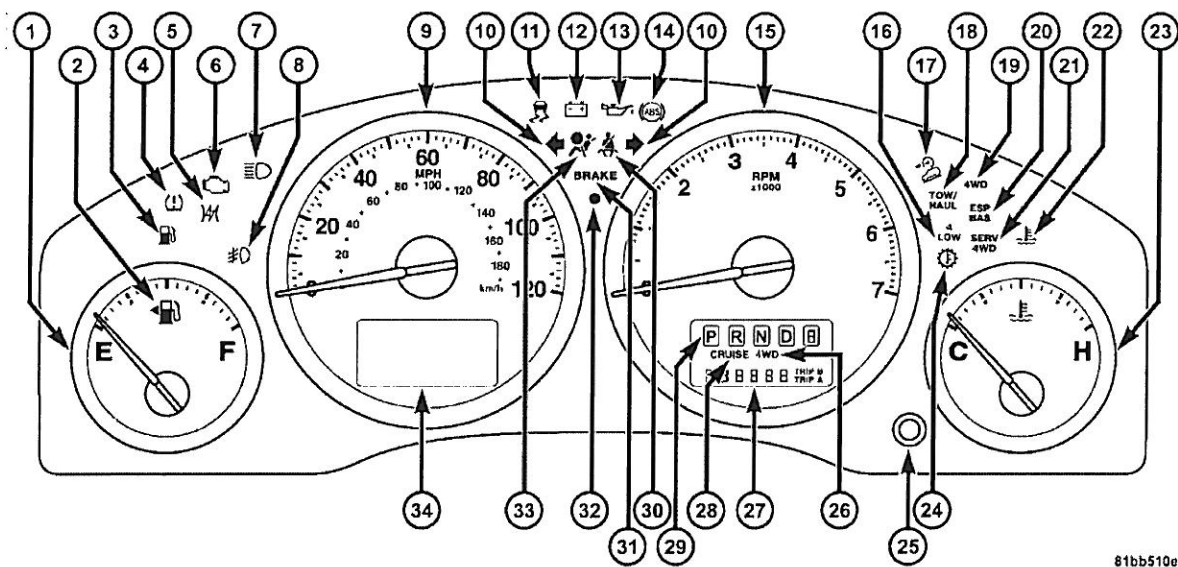
## **7.1 OWNER'S MANUAL PAGES**



010507683

## UNDERSTANDING YOUR INSTRUMENT PANEL 209

## INSTRUMENT CLUSTER



81bb510a

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(48 km/h). If these conditions are not met while attempting to use the HDC feature, the HDC indicator light will flash on/off.

#### 18. TOW/HAUL Indicator — If Equipped

**TOW/  
HAUL**

This light will illuminate when selecting TOW/HAUL. The TOW/HAUL button is located on the gearshift bezel.

#### 19. 4WD Indicator — Vehicles Equipped with Command-Trac®

**4WD**

This light alerts the driver that the vehicle is in the four-wheel drive mode. In this mode, the front driveshaft and rear driveshaft are mechanically locked together forcing the front and rear wheels to rotate at the same speed.

#### 20. Electronic Stability Program (ESP) / Brake Assist System (BAS) Indicator Light — If Equipped

**ESP  
BAS**

The malfunction indicator for the Electronic Stability Program (ESP) is combined with the Brake Assist System (BAS). The yellow "ESP/BAS Warning Light" in the instrument cluster comes on when the ignition switch is turned to the ON position. It should go out with the engine running. If the "ESP/BAS Warning Light" comes on continuously with the engine running, a malfunction has been detected in either the ESP or the BAS system, or both. If this light remains on after the several ignition cycles, and the vehicle has been driven several miles/kilometers at speeds greater than 30 mph (48 km/h), see an authorized dealer as soon as possible to have the problem diagnosed and corrected.

**NOTE:** The ESP Control System will make buzzing or clicking sounds when it is active. This is normal; the

sound will stop when the ESP becomes inactive following a maneuver that caused the ESP activation.

#### WARNING!

If a warning light remains on the system may not be working and you will not have the benefit of ESP or BAS. Under certain driving conditions, where ESP or BAS would be beneficial, you - if you have not adjusted your driving speeds and stopping in or to account for the lack of the feature, may be in accident.

#### 21. SERV (Service) 4WD Indicator Light — If Equipped

**SERV  
4WD**

The "SERV 4WD Indicator Light" will turn on when the ignition key is turned to the ON position and it will stay on for two seconds. If the light stays on or turns on during driving, it means that the 4WD system is not functioning properly and that service is required.

#### 22. Engine Temperature Warning Light



This light warns of an overheated engine condition. As temperatures rise and the gauge approaches H, this indicator will illuminate and a single chime will sound after reaching a set threshold. Further overheating will cause the temperature gauge to pass H, the indicator will continuously flash and a continuous chime will occur until the engine is allowed to cool.

If the light turns on while driving, safely pull over and stop the vehicle. If the A/C system is on, turn it off. Also, shift the transmission into NEUTRAL and idle the vehicle. If the temperature reading does not return to normal, turn the engine off immediately and call for service. Refer to "If Your Engine Overheats" in "What To Do In Emergencies" for further information.

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benefit of the system, you must apply continuous braking pressure during the stopping sequence, (do not "pump" the brakes). Do not reduce brake pedal pressure unless braking is no longer desired. Once the brake pedal is released, the BAS is deactivated.

### WARNING!

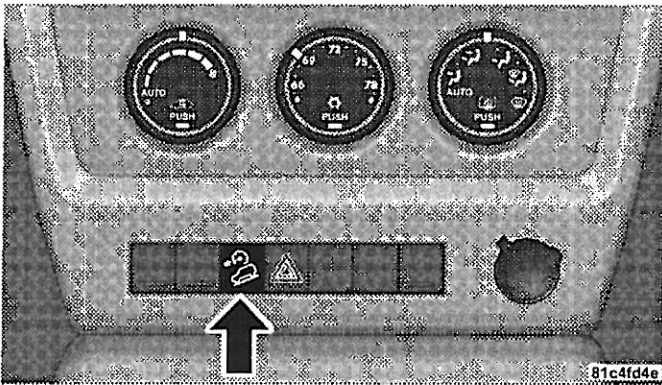
The Brake Assist System (BAS) cannot prevent the natural laws of physics from acting on the vehicle, nor can it increase the traction afforded by prevailing road conditions. BAS cannot prevent accidents, including those resulting from excessive speed in turns, driving on very slippery surfaces, or hydroplaning. Only a safe, attentive, and skillful driver can prevent accidents. The capabilities of a BAS-equipped vehicle must never be exploited in a reckless or dangerous manner, which could jeopardize the user's safety or the safety of others.

### Electronic Roll Mitigation (ERM)

This system anticipates the potential for wheel lift by monitoring the driver's steering wheel input and the speed of the vehicle. When ERM determines that the rate of change of the steering wheel angle and vehicle's speed are sufficient to potentially cause wheel lift, it then applies the appropriate brake and may also reduce engine power to lessen the chance that wheel lift will occur. ERM will only intervene during very severe or evasive driving maneuvers. ERM can only reduce the chance of wheel lift occurring during severe or evasive driving maneuvers. It cannot prevent wheel lift due to other factors, such as road conditions, leaving the roadway, or striking objects or other vehicles.

**NOTE:** ERM is disabled anytime the ESP is in "Full Off" mode. Refer to Electronic Stability Program (ESP) for a complete explanation of the available ESP modes.

The "Hill Descent" button is located in the lower switch bank below the climate control.



Hill Descent Button

#### Enabling HDC

1. Shift the transfer case into 4WD LOW range. Refer to "Four-Wheel Drive Operation" in "Starting and Operating" for further information.

2. Press the "Hill Descent" button. The "Hill Descent Control Indicator Light" in the instrument cluster will turn on solid.

**NOTE:** If the transfer case is not in 4WD LOW range, the "Hill Descent Control Indicator Light" will flash for five seconds and HDC will not be enabled.

#### Disabling HDC

1. Press the "Hill Descent" button or shift the transfer case out of 4WD LOW range. The "Hill Descent Control Indicator" light in the instrument cluster will turn off.

### Electronic Stability Program (ESP)

This system enhances directional control and stability of the vehicle under various driving conditions. ESP corrects for over-steering and under-steering the vehicle by applying the brake of the appropriate wheel. Engine power may also be reduced to help the vehicle maintain the desired path.

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The ESP uses sensors in the vehicle to determine the path that the driver intends to steer the vehicle and compares it to the actual path of the vehicle. When the actual path does not match the intended path, the ESP applies the brake of the appropriate wheel to assist in counteracting the condition of over-steer or under-steer.

- Oversteer - when the vehicle is turning more than appropriate for the steering wheel position.
- Understeer - when the vehicle is turning less than appropriate for the steering wheel position.

#### ESP/TCS Indicator Light



The "ESP/TCS Indicator Light" located in the instrument cluster, starts to flash as soon as the tires lose traction and the ESP system becomes active. The "ESP/TCS Indicator Light" also flashes when TCS is active. If the "ESP/TCS Indicator Light" begins to flash during acceleration, ease up on the

accelerator and apply as little throttle as possible. Be sure to adapt your speed and driving to the prevailing road conditions.

#### WARNING!

The ESP (Electronic Stability Program) cannot prevent the natural laws of physics from acting on the vehicle, nor can it increase the traction afforded by prevailing road conditions. ESP cannot prevent accidents, including those resulting from excessive speed in turns, driving on very slippery surfaces, or hydroplaning. Only a safe, attentive, and skillful driver can prevent accidents. The capabilities of an ESP-equipped vehicle must never be exploited in a reckless or dangerous manner, which could jeopardize the user's safety or the safety of others.

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#### 348 STARTING AND OPERATING

Depending upon model and mode of operation, the ESP system has up to three operating modes: "ESP On" "Partial Off," and "Full Off."

##### *ESP On — Two-Wheel Drive Vehicles and Four-Wheel Drive Vehicles in 2WD and 4WD High Range*

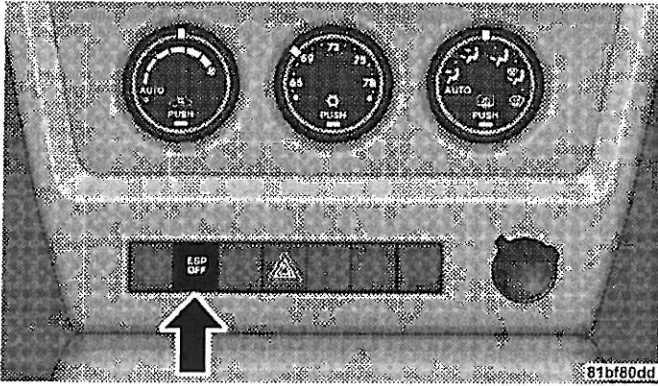
This is the normal operating mode for ESP when operating a two-wheel drive vehicle. It is also the normal mode for operating a four-wheel drive vehicle in 2WD or 4WD HIGH range. The ESP system will be in "ESP On" mode whenever the vehicle is started or the transfer case (if equipped) is shifted out of 4WD LOW range. This mode should be used for most driving situations. ESP should only be turned to "Partial Off" or "Full Off" for specific reasons as noted. Refer to "Partial Off" and to "Full Off" for additional information.

##### *Partial Off — Two-Wheel Drive Vehicles and Four-Wheel Drive Vehicles in 2WD and 4WD High Range*

The "Partial Off" mode is intended for driving in deep snow, sand, or gravel. This mode raises the threshold for TCS and ESP activation, which allows for more wheel spin than what ESP normally allows.

The "ESP OFF" button is located in the lower switch bank below the climate control. To enter the "Partial Off" mode, momentarily press the "ESP OFF" button and the "ESP/TCS Indicator Light" will illuminate. To turn the ESP on again, momentarily press the "ESP OFF" button and the "ESP/TCS Indicator Light" will turn off. This will restore the normal "ESP On" mode of operation.

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ESP Off Button

**NOTE:** To improve the vehicle's traction when driving with snow chains, or when starting off in deep snow, sand, or gravel, it may be desirable to switch to the "Partial Off" mode by momentarily pressing the "ESP OFF" button. Once the situation requiring "Partial Off"

mode is overcome, turn ESP back on by momentarily pressing the "ESP OFF" button. This may be done while the vehicle is in motion.

#### *Full Off — Four-Wheel Drive Vehicles in 4WD High and 4WD Low Range*

The "Full Off" mode is intended for off-highway and off-road use when ESP stability features could inhibit vehicle maneuverability due to trail conditions.

The "ESP OFF" button is located in the lower switch bank below the climate control panel. To enter "Full Off" mode, press and hold the "ESP OFF" button for five seconds while the vehicle is stopped with the engine running. After five seconds, the "ESP/TCS Indicator Light" will illuminate and an "ESP OFF" message will appear in the odometer. Press and release the trip odometer button located on the instrument cluster to turn off this message.

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### 350 STARTING AND OPERATING

In this mode, ESP and TCS are turned off (except for the "limited slip" feature described in the TCS section) until the vehicle reaches a speed of 40 mph (64 km/h). At speeds over 40 mph (64 km/h), the system automatically switches to "Partial Off" mode, described above. When the vehicle speed returns to less than 35 mph (56 km/h), the ESP system will return to "Full Off" mode. The "ESP/TCS Indicator Light" is always illuminated when ESP is off. To turn ESP on again, momentarily press the "ESP OFF" button. This will restore the normal "ESP On" mode of operation.

#### **NOTE:**

- "Full Off" is the only operating mode for ESP in 4WD LOW range. The ESP system will be in this mode whenever the vehicle is started in 4WD LOW range or the transfer case is shifted into 4WD LOW range.
- The "ESP OFF" message will display and a chime will sound when the shift lever is moved from any position

to the PARK position and then moved out of the PARK position. This will occur even if the message was cleared previously.

#### **WARNING!**

With the ESP switched off, the enhanced vehicle stability offered by ESP is unavailable. In an emergency evasive maneuver, the ESP system will not engage to assist in maintaining stability. "Full Off" mode is only intended for off-highway or off-road use.

#### **ESP/BAS Warning Light and ESP/TCS Indicator Light**

##### **ESP BAS**

The malfunction indicator for the ESP is combined with the BAS indicator. The "ESP/BAS Malfunction Indicator Light" and the "ESP/TCS Indicator Light" in the instrument cluster both turn on when the ignition switch is turned to the

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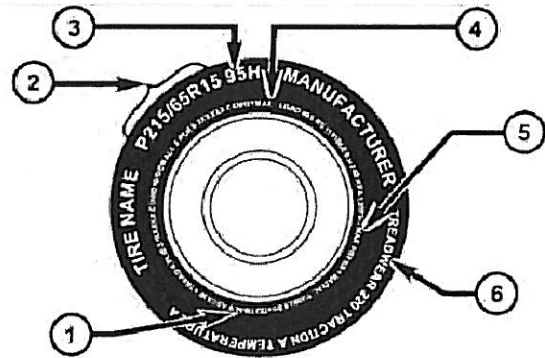
ON position. They should both turn off with the engine running. If the "ESP/BAS Malfunction Indicator Light" turns on continuously with the engine running, a malfunction has been detected in either the ESP or the BAS system, or both. If this light remains on after several ignition cycles, and the vehicle has been driven several miles/kilometers at speeds greater than 30 mph (48 km/h), see your authorized dealer as soon as possible to have the problem diagnosed and corrected.

**NOTE:**

- "The ESP/TCS Indicator Light" and the "ESP/BAS Malfunction Indicator Light" will turn on momentarily each time the ignition switch is turned ON.
- Each time the ignition is turned ON, the ESP System will be ON even if it was turned off previously.
- The ESP Control System will make buzzing or clicking sounds when it is active. This is normal; the sounds will stop when ESP becomes inactive following the maneuver that caused the ESP activation.

## TIRE SAFETY INFORMATION

### Tire Markings



054903773

- 1 — U.S. DOT Safety Standards Code (TIN)  
 2 — Size Designation  
 3 — Service Description

- 4 — Maximum Load  
 5 — Maximum Pressure  
 6 — Treadwear, Traction and Temperature Grades

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## 7.2 VEHICLE ARRIVAL CONDITION REPORT

CONTRACT NO. DTNH22-08-D-00097 DATE: 08/19/10

FROM: Coughlin Cars

TO: TRC

PURPOSE: (X) Initial Receipt ( ) Received via Transfer ( ) Present vehicle condition

MODEL YEAR/MAKE/MODEL/BODY STYLE: 2010 / Jeep / Liberty / MPV

MANUFACTURE DATE: 06/10 NHTSA NO.: CA0304

BODY COLOR: Blue VIN: 1J4PN2GK1AW179502

ODOMETER READING: 33 miles GVWR: 2,541 KG

PURCHASE PRICE: \$ rented / leased DEALER'S NAME: Coughlin Cars, 15777 Watkins Road, Marysville, OH 43040

X ALL OPTIONS LISTED ON "WINDOW STICKER" ARE PRESENT ON THE TEST VEHICLE

X TIRES AND WHEEL RIMS ARE NEW AND THE SAME AS LISTED

X THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS

X THE VEHICLE HAS BEEN PROPERLY PREPARED AND IS IN RUNNING CONDITION

X THE GLOVE BOX CONTAINS AN OWNER'S MANUAL, WARRANTY DOCUMENT, CONSUMER INFORMATION, AND EXTRA SET OF KEYS

X PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE

X PLACE VEHICLE IN STORAGE AREA

X INSPECT THE VEHICLE'S INTERIOR AND EXTERIOR, INCLUDING ALL WINDOWS, SEATS, DOORS, ETC., TO CONFIRM THAT EACH SYSTEM IS COMPLETE AND FUNCTIONAL PER THE MANUFACTURER'S SPECIFICATIONS. ANY DAMAGE, MISADJUSTMENT, OR OTHER UNUSUAL CONDITION THAT COULD INFLUENCE THE TEST PROGRAM OR TEST RESULTS SHALL BE RECORDED. REPORT ANY ABNORMAL CONDITION TO THE NHTSA COTR BEFORE BEGINNING ANY TEST

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 08-19-10  
DATE: 10-20-10

### 7.3 VEHICLE COMPLETION CONDITION REPORT

CONTRACT NO. DTNH22-08-D-00097 DATE: 09/14/10

MODEL YEAR/MAKE/MODEL/BODY STYLE: 2010 / Jeep / Liberty / MPV

MANUFACTURE DATE: 06/10 NHTSA NO.: CA0304

BODY COLOR: Blue VIN: 1J4PN2GK1AW179502

ODOMETER READING: 158 miles GVWR: 2,541 KG

LIST OF FMVSS TESTS PERFORMED BY THIS LAB: 126, 135

X THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS

X THE VEHICLE HAS BEEN PROPERLY MAINTAINED AND IS IN RUNNING CONDITION

X THE GLOVE BOX CONTAINS AN OWNER'S MANUAL, WARRANTY DOCUMENT,  
CONSUMER INFORMATION, AND EXTRA SET OF KEYS

X PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE

#### REMARKS:

Equipment that is no longer on the test vehicle as noted on Vehicle Arrival Condition Report:  
None.

Explanation for equipment removal:  
N/A

Test Vehicle Condition:  
Like new.

RECORDED BY: Alan Ida  
APPROVED BY: Ken Webster

DATE: 09-14-10  
DATE: 10-20-10

# 7.4 SINE WITH DWELL TEST RESULTS

2010 Jeep Liberty (2WD Mode)

NHTSA No.: CA0304

Date Created 25-Aug-10

File	SWA @ 5deg Ct	MES	Time@5deg	COS	Time@COS	MOS	Time@MOS	YRR1(%)	YR1 (deg/sec)	YRR1 Ct	YRR175(%)	YR175 (deg/sec)
0029	620	50.287	3.091	999	4.988	755	3.768	0.213	0.021	1199	-0.038	-0.004
0030	619	50.276	3.085	999	4.990	756	3.770	0.165	0.022	1199	0.291	0.038
0031	617	50.363	3.077	999	4.987	755	3.766	0.352	0.059	1199	0.603	0.100
0032	616	50.314	3.073	999	4.986	755	3.766	-1.055	-0.211	1199	-1.118	-0.224
0033	616	50.300	3.072	999	4.987	755	3.768	-0.961	-0.229	1199	-1.176	-0.280
0034	615	50.356	3.068	998	4.984	755	3.766	-0.126	-0.036	1198	-1.026	-0.292
0035	615	50.372	3.069	999	4.987	755	3.768	-0.210	-0.068	1199	-0.590	-0.192
0036	615	50.367	3.067	999	4.985	755	3.766	0.174	0.063	1199	0.019	0.007
0037	615	50.311	3.065	998	4.985	755	3.766	0.394	0.155	1198	-0.395	-0.155
0038	614	50.456	3.065	999	4.985	755	3.765	-0.283	-0.105	1199	-0.376	-0.139
0039	615	50.069	3.066	999	4.987	755	3.767	-0.012	-0.005	1199	-0.711	-0.274
0040	615	50.244	3.066	999	4.987	755	3.768	-0.390	-0.152	1199	-0.395	-0.154
0041	615	50.248	3.067	999	4.987	755	3.769	0.163	0.069	1199	0.023	0.009
0042	615	50.486	3.066	999	4.986	755	3.768	0.030	0.013	1199	-0.725	-0.322
0043	615	50.357	3.068	999	4.986	755	3.770	0.127	0.056	1199	0.068	0.030
0044	615	50.162	3.069	999	4.988	756	3.771	-0.311	-0.140	1199	-0.246	-0.111
0045	615	50.379	3.066	998	4.984	755	3.768	0.019	0.009	1198	-0.137	-0.063
0046	615	50.411	3.065	998	4.983	755	3.768	-0.079	-0.036	1198	-0.284	-0.131
0047	615	50.339	3.070	999	4.988	756	3.772	0.290	0.142	1199	-0.052	-0.025
0048	615	50.208	3.067	998	4.984	755	3.770	-0.142	-0.068	1198	-0.318	-0.153
0049	615	50.204	3.069	999	4.986	756	3.771	0.205	0.100	1199	-0.161	-0.078
0050	620	50.218	3.090	999	4.989	755	3.769	-0.719	0.073	1199	-0.700	0.071
0051	618	50.333	3.084	999	4.989	755	3.769	-0.910	0.124	1199	-1.946	0.265
0052	617	50.229	3.077	999	4.987	755	3.767	0.546	-0.097	1199	-0.003	0.001
0053	616	50.450	3.072	998	4.984	755	3.766	-0.799	0.174	1198	-0.345	0.075
0054	615	50.107	3.070	998	4.984	755	3.765	-0.772	0.186	1198	-0.590	0.142
0056	616	50.023	3.072	999	4.988	755	3.768	-0.492	0.135	1199	-0.815	0.223
0057	615	50.104	3.069	999	4.986	755	3.767	0.921	-0.302	1199	-0.455	0.149
0058	615	50.285	3.067	998	4.984	755	3.767	-0.210	0.072	1198	-0.536	0.184
0059	615	50.276	3.067	999	4.987	755	3.767	-0.728	0.266	1199	-0.784	0.286
0060	615	50.124	3.066	999	4.985	755	3.766	-0.762	0.251	1199	-0.627	0.207
0061	615	50.110	3.068	999	4.989	755	3.769	-0.806	0.248	1199	-1.018	0.313
0062	615	50.027	3.067	999	4.988	755	3.769	-0.346	0.130	1199	0.030	-0.011
0063	614	50.497	3.065	999	4.985	755	3.766	-0.294	0.124	1199	-0.224	0.094
0064	615	50.330	3.068	999	4.988	756	3.770	0.425	-0.158	1199	0.208	-0.077
0065	614	50.614	3.064	998	4.984	755	3.767	0.505	-0.193	1198	0.461	-0.176
0066	615	50.381	3.065	998	4.984	755	3.767	0.631	-0.269	1198	0.436	-0.186
0067	615	50.297	3.068	999	4.988	756	3.771	0.183	-0.083	1199	0.214	-0.097
0068	615	50.435	3.066	998	4.985	755	3.769	-0.158	0.069	1198	-0.007	0.003
0069	615	50.431	3.066	998	4.984	755	3.769	0.349	-0.157	1198	0.273	-0.123
0070	615	50.224	3.070	999	4.987	756	3.772	0.473	-0.216	1199	0.411	-0.188
0071	615	50.353	3.069	999	4.986	756	3.771	0.128	-0.062	1199	-0.003	0.002



## 7.4 SINE WITH DWELL TEST RESULTS

2010 Jeep Liberty (2WD Mode)

NHTSA No.: CA0304

Date Created 25-Aug-10

File	YRR175 Ct	2nd Yaw Peak(deg/sec)	2nd Yaw Peak Ct	Lat Disp (ft)	Lat. Acc. 1.07s (g)	1st SWA Peak(deg)	1st SWA Peak Ct	2nd SWA Mean(deg)
0029	1349	9.657	865	-2.907	0.247	35.858	684	35.875
0030	1349	13.101	855	-3.947	0.303	47.912	684	47.875
0031	1349	16.646	854	-5.050	0.341	60.862	684	60.809
0032	1349	20.014	847	-5.803	0.371	72.782	684	72.749
0033	1349	23.856	852	-6.638	0.371	84.767	684	84.816
0034	1348	28.433	855	-7.300	0.346	96.677	683	96.662
0035	1349	32.605	855	-7.896	0.250	108.947	684	109.024
0036	1349	36.270	854	-8.239	0.191	120.914	684	120.932
0037	1348	39.241	854	-8.551	0.195	132.970	683	133.014
0038	1349	37.025	860	-8.819	0.040	144.887	683	145.113
0039	1349	38.595	856	-8.801	0.189	156.987	684	157.090
0040	1349	38.964	852	-8.902	0.269	168.891	684	169.002
0041	1349	42.012	857	-9.124	0.153	181.875	684	181.879
0042	1349	44.432	858	-9.315	0.109	193.837	684	193.859
0043	1349	44.465	859	-9.363	0.097	206.127	684	206.078
0044	1349	45.017	858	-9.434	0.107	218.043	684	218.112
0045	1348	46.083	854	-9.374	0.140	229.963	684	229.885
0046	1348	46.195	853	-9.632	0.117	241.849	684	241.908
0047	1349	49.042	851	-9.621	0.168	253.814	685	253.938
0048	1348	48.066	851	-9.755	0.060	265.800	684	265.795
0049	1349	48.654	850	-9.646	0.095	269.704	685	269.766
0050	1349	-10.093	860	2.992	-0.244	36.625	684	36.294
0051	1349	-13.640	865	3.806	-0.300	48.543	684	48.324
0052	1349	-17.711	858	4.590	-0.353	61.469	684	61.302
0053	1348	-21.803	865	5.443	-0.364	73.520	683	73.165
0054	1348	-24.050	848	6.142	-0.384	85.345	683	85.283
0056	1349	-27.358	854	6.605	-0.427	96.815	684	97.370
0057	1349	-32.735	855	7.369	-0.312	108.979	684	109.775
0058	1348	-34.253	851	7.583	-0.407	121.244	684	121.489
0059	1349	-36.521	843	8.045	-0.420	133.059	684	134.003
0060	1349	-32.994	843	8.257	-0.221	145.219	683	145.857
0061	1349	-30.793	845	8.494	-0.248	157.003	684	157.983
0062	1349	-37.596	852	8.718	-0.124	169.710	684	169.363
0063	1349	-42.146	853	8.850	-0.098	182.502	684	182.387
0064	1349	-37.168	856	8.947	-0.073	194.536	684	194.188
0065	1348	-38.151	852	9.142	-0.103	206.831	683	206.401
0066	1348	-42.695	856	8.946	-0.095	218.800	683	218.395
0067	1349	-45.242	856	9.374	-0.056	230.661	684	230.338
0068	1348	-43.346	854	9.435	-0.030	242.723	684	242.151
0069	1348	-44.945	847	9.372	-0.110	254.601	684	254.165
0070	1349	-45.677	853	9.366	-0.073	266.468	684	266.119
0071	1349	-48.210	849	9.516	-0.116	270.475	684	270.043

## 7.4 SINE WITH DWELL TEST RESULTS

2010 Jeep Liberty (4WD Mode)

NHTSA No.: CA0304

Date Created 26-Aug-10

File	SWA @ 5deg Ct	MES	Time@5deg	COS	Time@COS	MOS	Time@MOS	YRR1(%)	YR1 (deg/sec)	YRR1 Ct	YRR175(%)	YR175 (deg/sec)
0030	618	50.044	3.081	998	4.983	755	3.767	-0.916	-0.121	1198	-0.283	-0.037
0031	617	50.163	3.077	998	4.983	755	3.770	0.323	0.058	1198	0.753	0.135
0032	617	50.263	3.075	999	4.987	756	3.771	0.452	0.104	1199	0.189	0.044
0033	616	50.148	3.072	999	4.986	756	3.771	1.236	0.354	1199	0.920	0.264
0034	616	50.294	3.070	999	4.986	756	3.771	1.465	0.481	1199	1.666	0.547
0035	615	50.327	3.066	998	4.985	755	3.766	-0.379	-0.146	1198	-0.456	-0.175
0036	614	50.570	3.065	998	4.984	755	3.766	-0.093	-0.034	1198	0.337	0.125
0037	615	50.223	3.067	999	4.987	755	3.769	-0.057	-0.021	1199	-0.146	-0.052
0038	615	50.392	3.066	999	4.986	755	3.768	-0.325	-0.135	1199	-0.252	-0.105
0039	615	50.292	3.066	999	4.985	755	3.768	0.676	0.287	1199	-0.216	-0.092
0040	615	50.276	3.068	999	4.988	756	3.771	-0.358	-0.160	1199	-0.360	-0.161
0041	615	50.147	3.069	999	4.988	756	3.772	-0.142	-0.065	1199	-0.232	-0.106
0042	615	50.502	3.065	998	4.983	755	3.768	-0.321	-0.152	1198	0.085	0.040
0043	615	50.337	3.069	999	4.988	756	3.772	0.014	0.007	1199	-0.035	-0.018
0044	615	50.490	3.068	999	4.986	756	3.770	-0.181	-0.090	1199	-0.140	-0.070
0045	618	50.348	3.082	999	4.988	755	3.768	-1.552	0.218	1199	-0.326	0.046
0046	616	50.473	3.075	999	4.985	755	3.766	-0.036	0.007	1199	-1.189	0.227
0047	616	50.214	3.074	999	4.988	755	3.769	0.348	-0.081	1199	0.050	-0.012
0048	615	50.337	3.068	998	4.984	755	3.765	0.810	-0.227	1198	-0.118	0.033
0049	615	50.445	3.069	998	4.985	755	3.768	1.487	-0.476	1198	0.305	-0.098
0050	615	50.252	3.065	998	4.983	755	3.765	-0.050	0.018	1198	0.059	-0.022
0051	615	50.307	3.068	999	4.989	755	3.769	0.489	-0.152	1199	0.664	-0.206
0052	615	49.899	3.069	999	4.990	756	3.770	0.182	-0.061	1199	-0.148	0.049
0053	614	50.266	3.064	998	4.984	755	3.765	-0.255	0.098	1198	-0.505	0.194
0054	615	50.148	3.065	998	4.985	755	3.767	0.108	-0.041	1198	-0.104	0.040
0055	615	50.553	3.066	999	4.985	755	3.768	-0.304	0.132	1199	-0.230	0.100
0056	615	50.341	3.067	999	4.986	755	3.770	-0.332	0.147	1199	-0.278	0.123
0058	615	50.366	3.070	999	4.989	756	3.772	0.436	-0.211	1199	0.130	-0.063
0059	615	50.528	3.069	999	4.987	756	3.771	-0.294	0.134	1199	-0.194	0.088
0060	616	50.423	3.071	999	4.989	756	3.772	-0.101	0.051	1199	0.023	-0.012

# 7.4 SINE WITH DWELL TEST RESULTS 2010 Jeep Liberty (4WD Mode) NHTSA No.: CA0304

Date Created

File	YRR175 Ct	2nd Yaw Peak(deg/sec)	2nd Yaw Peak Ct	Lat Disp (ft)	Lat. Acc. 1.07s (g)	1st SWA Peak(deg)	1st SWA Peak Ct	2nd SWA Mean(deg)
0030	1348	13.222	863	-4.075	0.306	48.907	683	48.476
0031	1348	17.957	850	-5.056	0.367	64.835	684	64.330
0032	1349	23.051	852	-6.409	0.378	80.914	685	80.239
0033	1349	28.661	858	-7.204	0.351	96.765	685	96.211
0034	1349	32.852	847	-7.844	0.382	113.518	685	112.431
0035	1348	38.411	851	-8.505	0.222	129.966	683	130.037
0036	1348	36.956	859	-8.937	-0.025	145.945	683	146.185
0037	1349	35.826	855	-9.046	0.125	162.133	684	161.967
0038	1349	41.615	850	-9.105	0.200	177.938	684	178.084
0039	1349	42.492	855	-9.272	0.141	193.910	684	193.978
0040	1349	44.818	857	-9.463	0.071	211.111	684	211.103
0041	1349	45.693	860	-9.426	0.078	227.046	684	227.060
0042	1348	47.240	862	-9.655	0.050	242.909	683	242.926
0043	1349	50.810	858	-9.682	0.053	259.020	684	258.872
0044	1349	49.901	864	-9.832	0.038	269.872	684	269.709
0045	1349	-14.030	859	3.774	-0.304	49.511	684	49.332
0046	1349	-19.088	865	4.964	-0.367	65.476	683	65.274
0047	1349	-23.398	846	5.826	-0.400	81.253	684	81.258
0048	1348	-28.028	850	6.545	-0.468	97.236	683	97.279
0049	1348	-32.033	849	7.246	-0.436	113.474	684	113.450
0050	1348	-36.832	842	7.785	-0.466	130.471	683	130.508
0051	1349	-31.035	846	8.334	-0.298	146.568	684	146.490
0052	1349	-33.418	848	8.606	-0.213	162.485	684	162.454
0053	1348	-38.382	863	8.629	-0.187	178.588	683	178.400
0054	1348	-38.274	852	8.804	-0.222	194.560	684	194.221
0055	1349	-43.256	851	9.090	-0.194	211.771	684	211.492
0056	1349	-44.259	858	9.258	-0.127	227.774	684	227.374
0058	1349	-48.515	858	9.461	-0.175	243.732	684	243.297
0059	1349	-45.615	857	9.377	-0.137	259.656	684	259.171
0060	1349	-50.221	859	9.489	-0.135	270.459	685	270.182

# 7.5 SLOWLY INCREASING STEER TEST RESULTS 2010 Jeep Liberty (2WD Mode) NHTSA No.: CA0304

Date Created 25-Aug-10

File	Vehicle	EventPt	DOS	MES [mph]	Mean SPD [mph]	AYcount_3	THETAENCF_3 [degree]	AYCG_CD2_3 [g]	r_squared	ZeroBegin	ZeroEnd
0008	2010 Jeep Liberty 2WD	704	1	50.148	50.205	1062	-24.137	-0.308	0.996	504	704
0011	2010 Jeep Liberty 2WD	649	1	50.274	49.941	1072	-24.769	-0.297	0.998	449	649
0014	2010 Jeep Liberty 2WD	698	1	49.873	50.245	1071	-24.628	-0.299	0.997	498	698
0019	2010 Jeep Liberty 2WD	701	0	50.006	50.050	1063	24.649	0.293	0.997	501	701
0021	2010 Jeep Liberty 2WD	702	0	50.315	50.669	1041	23.074	0.293	0.998	502	702
0022	2010 Jeep Liberty 2WD	593	0	50.597	50.345	1047	23.736	0.298	0.989	393	593
Averages							24.2	0.298			

Scalars Steering Angles (deg)

1.5	36
2	48
2.5	61
3	73
3.5	85
4	97
4.5	109
5	121
5.5	133
6	145
6.5	157
7	169
7.5	182
8	194
8.5	206
9	218
9.5	230
10	242
10.5	254
11	266
11.2	270



# 7.5 SLOWLY INCREASING STEER TEST RESULTS 2010 Jeep Liberty (4WD Mode) NHTSA No.: CA0304

Date Created

26-Aug-10

File	Vehicle	EventPt	DOS	MES [mph]	Mean SPD [mph]	AYcount_3	THETAENCF_3 [degree]	AYCG_CD2_3 [g]	r_squared	ZeroBegin	ZeroEnd
0008	2010 Jeep Liberty 4WD	700	1	51.155	49.973	1176	-31.918	-0.300	0.998	500	700
0011	2010 Jeep Liberty 4WD	694	1	50.044	49.202	1189	-32.638	-0.302	0.999	494	694
0013	2010 Jeep Liberty 4WD	705	1	49.581	49.433	1169	-31.325	-0.299	0.998	505	705
0014	2010 Jeep Liberty 4WD	701	0	50.032	50.414	1173	32.113	0.302	0.998	501	701
0015	2010 Jeep Liberty 4WD	701	0	50.577	50.498	1181	32.626	0.309	0.997	501	701
0025	2010 Jeep Liberty 4WD	702	0	50.240	50.443	1197	33.662	0.296	0.992	502	702
	Averages						32.4	0.301			

Scalars

Steering Angles (deg)

1.5	49
2	65
2.5	81
3	97
3.5	113
4	130
4.5	146
5	162
5.5	178
6	194
6.5	211
7	227
7.5	243
8	259
8.3	270

## 7.6 INERTIA SENSOR MEASUREMENTS

2010 Jeep Liberty

NHTSA No.: CA0304

Device : U12-05-08-07108  
device version : 2.24  
device certification date : 07/30/10  
today is : 8/24/2010  
units : Millimeters

Label	ActualX	ActualY	ActualZ
C_DEVICEPOS001			
M_PLANE001	1317.345	-557.518	-347.473
M_LINE001	780.850	119.155	-26.120
M_ORIGIN_FRONT_AXLE_CENTER	0.000	0.000	0.000
C_COORDSYS001	0.000	0.000	0.000
M_TIRE_TREAD_CENTER	335.213	54.413	-119.540
M_INERTIA_PACK	1694.334	824.833	737.497
M_ROOF	2270.008	825.483	1402.734
M_GROUND	2270.807	-149.406	-347.558

Track Width 1555.750

Roof Height (relative to ground) 1750.292

Motion Pak - x-distance (mm)	1694.334		
Motion Pak - y-distance (mm)		-7.455	
Motion Pak - z-distance (mm)			1040.604

Motion Pak - x-distance (inches)	66.706		
Motion Pak - y-distance (inches)		-0.294	
Motion Pak - z-distance (inches)			40.969

x-distance (longitudinal) Point of reference is the front axle centerline.  
(Positive from front axle toward rear of vehicle.)

y-distance (lateral) Point of reference is the vehicle centerline.  
(Positive from the center toward the right.)

z-distance (vertical) Point of reference is the ground plane.  
(Positive from the ground up.)